EDITORIAL

Endoscopic Submucosal Dissection Using Endoscopic Robot: Endoscopist's Future Destination

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As you know, gastric neoplasm is the one of the most common cancer in Korea. From a global view point, gastric neoplasm holds the third ranks in cancer-related mortality.[1] From about 20 years ago, endoscopic submucosal dissection (ESD) method has been occupied a good therapeutic modality in case of early gastric cancer.[2,3] This method can provide good survival rates and better quality of life compared to previous surgical resection. However, ESD requires highly skilled doctors and various assistive devices for safe and effective procedure. According to recent data, to become a skilled endoscopist for ESD, for the trainees, about at least 30 cases were required to attain a higher technical level of competence in gastric ESD.[4] Despite the availability of a wide range of accessory devices including distal attachment caps, electrosurgical knifes, hemostatic forceps, and suturing devices, the standard flexible endoscopes used in mainstream practice struggle to support the performance of advanced endosurgical procedures.[5-9] They lack the dexterity required to make basic maneuvers, such as triangulation of instruments and in-tissue manipulation. Transmission of force from operator to point of action is suboptimal due to instability of the flexible endoscope. Moreover, the visual field is fixed by the direction of the endoscope, making visualization difficult when the field is constantly reoriented with any movement of the endoscope. Multiple robotic flexible endoscope platforms have been developed based on cross specialty collaboration between engineers and medical doctors. Until now, various assistive devices have been developed to perform effective procedure, for example, EndoSamurai (Olympus Medical Systems Corp., Tokyo, Japan), EndoMaster (Nanyang Technological University, Singapore), Master (EndoMASTER Pte. Ltd., Singapore), Endomina (Endo

Tools Therapeutics, Brussels, Belgium), Scorpion shaped endoscopic robot (Kyushu University, Fukuoka, Japan), Anubis (Karl Storz, Tuttlingen, Germany), and ViaCath (Hansen Medical, Mountain View, CA, USA). Moreover, operations using assistive robots are being conducted. Recently, study about the robot-assisted ESD for colorectal lesions was reported. This study showed that robotic-assisted ESD appears to be more effective in obtaining *en bloc* resection with shorter procedure times and a lower perforation rate, compared with conventional ESD as performed by ESD novices. Also, this method can be associated with lower physical and metal workloads. Although, this study was performed in case of colorectal lesions, the result was similar to our current issue.

In this issue of *Gut and Liver*, Kim *et al.*[10] reported "A pilot study of endoscopic submucosal dissection using an endoscopic assistive robot in a porcine stomach model." During ESD procedure, the membrane dissected in the initial stage of surgery hides the area that must be subsequently dissected, thereby making it difficult to dissect the submucosal layer as the surgery proceeds. This research team developed a revolute joint-based auxiliary transluminal endoscopic robot (REXTER) system. REXTER was developed to increase the efficiency and safety of ESD. In During ESD, REXTER provides operators with increased visibility of the dissection area as it lifts the mucosal flap dissected earlier. Therefore, operators can perform ESD while accurately identifying the dissection area until the end of the surgery. In this study, for the conventional method, significant differences were noted between skilled and unskilled operators regarding operation time (11.3 minutes vs 26.7 minutes) and perforation incidence (0/10 vs 6/10). Unskilled operators showed a large

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decrease in the perforation incidence with the robot-assisted method (conventional method vs robot-assisted method, 6/10 vs 1/10). Therefore, this study can suggest that the surgical safety of unskilled operators greatly improved with robotic assistance. It is possible that improved visualization of the submucosal layer would allow endoscopists to more readily identify and thus pre-coagulate submucosal vessels. Also, hemostasis of active bleeding may be easier to be performed with these features. However, we can suspect that these results can be generalized for larger lesions, or lesions in more challenging locations such as pyloric ring, fundus and greater curvature side of stomach body. And other important point is the cost of robotic procedure. Even if the procedure results are excellent, financial burden to patient should be reasonable.

In conclusions, REXTER appears to be more effective in obtaining *en bloc* resection with shorter procedure times and a lower perforation rate, compared with conventional ESD as performed by ESD novices. This study is very nice challenging study to suggest the way of endoscopist's future destination. In the future, I hope, with the advance of medical technology, therapeutic endoscopic procedure can have the potential to broad the range to the more complex procedure. And, globally, health systems have become increasingly budget conscious; widespread acceptance of robotic endoscopy will depend on careful design to ensure its delivery of a cost-effective service.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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