ADVANCES IN ENDOSCOPY

Current Developments in Diagnostic and Therapeutic Endoscopy

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Innovations in Endoscopic Submucosal Dissection Techniques and Technologies

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G&H From your perspective, which innovations over the last 5 to 10 years have most changed how endoscopic submucosal dissection is performed, and why?

MB Endoscopic submucosal dissection (ESD) is a great option for minimally invasive removal of precancerous and cancerous early gastrointestinal (GI) tract cancers. When ESD was first introduced, its adoption was limited because the tools at that time were not very efficient, and there is still a lot of work to be done. However, the tools in use today are significantly better than what was used 5 to 10 years ago. One of the key advancements has been the different types of dedicated ESD electrosurgical knives with improved injection and dissection functions, which have enabled better and quicker expansion of the submucosa, facilitating the dissection and removal of these lesions. Improvements in endoscope design such as more flexibility, bigger channels, and better retroflexion have also helped. In addition, enhanced imaging has allowed for better detection of these lesions. All these features together have definitely made ESD safer and more efficient.

G&H How do you think about choosing a traction strategy by organ and lesion location?

MB Traction has revolutionized modern ESD. Although no traction device is perfect, many different tools for traction are available. If the lesion is in a gravity-dependent area, the patient's position could be changed to allow gravity to act as traction. However, that is not always easy or feasible, especially in the United States where these procedures are often performed with anesthesia. Rotating the patient can be challenging, depending on the patient's body habitus and mobility, among other factors. The type of lesion is also a factor, especially if a lesion is large and involves different planes or is circumferential; gravity may not provide the needed traction. The stomach, rectum, and colon are places where traction is helpful. In the esophagus because it is a straight tube, tunneling and pocket techniques can be used, and traction, although sometimes needed, is less commonly used. For me, personally, if the lesion is small, traction is helpful after performing a circumferential mucosal incision. For dissection of a very large lesion, sometimes using gravity helps, but pocket creation, tunneling, or multipoint traction may be needed. There is no uniform approach to traction for every lesion; it depends on your personal preference and patient factors. The modern endoscopist who performs ESD needs to be comfortable with different techniques and then tailor them accordingly on a case-by-case basis to the patient, to the lesion, and to the location of the lesion in the GI tract.

G&H Are commercial traction systems meaningfully better than the handcrafted versions—where do they help most, and when are low-cost methods still sufficient?

MB Each traction method has pros and cons. Some of the commercially available traction methods are similar to a clip band method or a clip line method, and they may be deployed through the endoscope, which is convenient because the endoscope does not have to be pulled out.

Obviously, self-made or do-it-yourself traction methods are much more cost-effective. In terms of commercially available traction methods, several types of traction devices are available, including the overtube-based system (Lumendi), with dedicated traction arm, and the Tracmotion device (Fujifilm). Those certainly have added costs, and they may not always work. Choosing the type of traction also depends on whether single-point or dynamic traction is needed. If dynamic traction is needed, sometimes using a commercially available device, like the Lumendi traction device, which can be rotated by a controller and can take traction into different planes, is helpful. However, if single-point traction is needed, then using a conventional traction method such as a clip band, clip line, or clip suture can be good. In the esophagus, the clip line or clip suture method works well because it can be pulled out of the patient's mouth. A snare with a suture or a string can be placed and then used to push in or pull back to provide traction and counter-traction. There are other traction methods, like the AWC Duo (Ovesco), which serves as a dual working channel and typically works well if the lesion is in the user's plane in parallel to the endoscope. The traction method used also depends on the endoscopy unit and workflow, and how comfortable the endoscopy team is with having the endoscopist create the traction during a difficult procedure. If the team is comfortable with it and has all the supplies available, then it is easy; however, if the team is not comfortable with it, then sometimes the commercially available traction devices, while slightly more expensive, are easier to use because they reduce the time spent developing the traction tools.

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G&H How is the pocket-creation method performed, and what are the benefits of this technique?

MB The pocket-creation method utilizes the tunnel technique, like that used in peroral endoscopic myotomy procedures and submucosal tunneling endoscopic resection procedures, to create a pocket or tunnel underneath the lesion or the polyp. This enables the endoscopist to dissect or resect through the polyp, then after connecting both sides, create a pocket from one side of the lesion to the other side. If working in the colon, the pocket will be from the anal side to the oral side, or the oral side to the anal side, using the lateral edges to hold the polyp in place, so it is holding natural traction. Once finished with the pocket or tunneling across the lesion, the endoscopist can then finish the mucosal incision and take down the mucosal flaps that are left there. That is how the pocket-creation method is done. For a larger lesion (or those that involve >70% of circumference), attempting a circumferential incision can make everything really floppy and fluid can leak out, compromising the ability to dissect. For larger lesions, the pocket method is beneficial because a lot can be accomplished by holding the polyp's natural traction. The endoscopist using a single-point traction for large lesions eventually will need dynamic or multipoint traction because the traction is only in one place and will need to be readjusted. The pocket method basically uses the lesion itself, so there is no need to readjust the traction. The lesion is serving as a traction by the fact that whatever mucosa is connected is holding the traction, and the endoscopist can work around it.

G&H Which new technologic advances are truly needle-moving for efficiency and safety?

MB Personally for me, knives that have the ability to do a power injection make the procedure much more efficient. The different types of knives with better hemostasis have had the most impact. Some of the newer electrosurgical units, especially VIO 3 (Erbe), have greatly facilitated hemostasis, which was a big limitation before. There is also microwave technology that is gaining popularity. Again, some of the newer endoscope designs, with better flexibility and larger working channels that allow for suction of fluid at the same time as the device is in place, have increased efficiency. Underwater ESD, or saline immersion ESD, is another advancement to highlight because it allows endoscopists to use gravity to their advantage. Some of the traction techniques, as they are evolving and developing, can help in select cases. All these advances combined have made ESD efficient, safer, and feasible, which is why adoption of ESD is increasing.

G&H How should endoscopists integrate digital imaging tools into pre-ESD staging and real-time decision-making?

MB In the United States, endoscopists are learning more and more about optical diagnosis. Not just for ESD but in general, lesion resection will be based on optical diagnosis. If the endoscopist can confidently predict the histology of a polyp, and it is a sessile serrated lesion (SSL), cold endoscopic mucosal resection (EMR) may be sufficient because

data show that there is no difference in recurrence between cold EMR and hot EMR. Whereas if there is concern for an early submucosal invasive cancer, superficial cancer, or advanced dysplasia, in those cases, ESD may be helpful. The endoscopist who is competent in optical diagnosis can: first, prevent unnecessary referrals to surgery and could prevent a patient from undergoing a major operation by a referral to an expert who performs ESD; second, knows which lesions to resect using ESD and when to avoid conventional techniques like standard polypectomy or EMR; and third, can predict when ESD is not needed such as when the lesion is benign, with no advanced histology, in which case, ESD may not be cost-effective. There are fewer experts performing ESD, so it is important to not overburden them with dissecting polyps that can be removed with conventional resection techniques. From that standpoint, optical diagnosis is key. Obviously, there is a learning curve to optical diagnosis. Older studies looking at intraobserver variability show that even experts are not good at it. However, as optical diagnosis is increasingly utilized in the West, there will be greater understanding and better prediction of polyp histology to help with deciding which resection technique to use, what can be done through endoscopy, and what needs surgery.

G&H What is the realistic near-term role of artificial intelligence in ESD?

MB Artificial intelligence (AI) in colonoscopy or endoscopy has focused mostly on lesion detection, or computer-aided detection. However, I expect much more literature to be published on computer-aided diagnosis, or CADx, where the AI system would be able to predict histology. Eventually, AI may be able to not only provide us with the diagnosis, whether a lesion is an SSL or has high-grade dysplasia or submucosally invasive cancer, but also create a clinical decision algorithm to help determine when a patient can undergo resection with EMR, should undergo ESD, or needs surgery.

G&H Is flexible endoluminal robotics getting closer to prime-time use? What do you see as the most plausible first everyday use of robotics in ESD, and what barriers still need to be solved?

MB There is no doubt that robotic technology has a future in endoscopy and ESD. Whether it is ready for prime time will depend on the cost of the robot, how much space it needs, what is the reimbursement, and how much time it will add. Those are the biggest barriers right now. Although current robotic technology is very encouraging, there will definitely be future iterations that will make it easier to use and incorporate into practice. Whether robotic systems will be used in the endoscopy suite or in the operating room (or a hybrid of both) will likely come down to cost, space, and efficiency. Robots will probably be more helpful for larger lesions in challenging locations. For most lesions in easy locations in the esophagus, stomach, and rectum, performing ESD without the robot will probably be more cost-effective. However, for lesions in the right colon, duodenum, and difficult positions in the stomach such as the fundus or areas where full retroflexion is needed, where ESD may be challenging, robots will be helpful.

G&H Looking ahead, where do you think indications will expand, and where should ESD probably remain limited?

MB For areas where surgery is associated with higher morbidity such as rectal, esophageal, and gastric surgeries, I think ESD is critical. For other indications such as colon surgeries, which typically are associated with less morbidity and may be more acceptable to the patient owing to less risk for ostomy and complications, I think the role of ESD is evolving. Performing ESD for superficial tumors or all precancerous lesions in the GI tract is probably not going to yield additional benefit and will be very lesion-specific, but certainly the indications for ESD are expanding. An area where ESD is still challenging is in the small intestine or the duodenum. Greater understanding about the natural history of lesions in areas with higher morbidity and the risks of malignant transformation and recurrence rate after ESD, especially in the duodenum, is needed.

Disclosures

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Suggested Reading

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