

ADVANCES IN ENDOSCOPY

Current Developments in Diagnostic and Therapeutic Endoscopy

Section Editor: Klaus Mergener, MD, PhD, MBA

Conventional vs Full-Thickness Resection Techniques for Large Polyps



Arthur Schmidt, MD
 Professor of Medicine
 Chief of the Department of Gastroenterology, Hepatology, and Endocrinology
 Robert Bosch Hospital
 Robert Bosch Health Campus
 Stuttgart, Germany

G&H What are the important characteristics of large polyps that help in determining which polyps to remove and which resection technique to use?

AS There are several features of the lesion to consider, the first of which is the size of the lesion. The greater the size, the more complex the resection will probably be. Second, the endoscopist must consider the location of the lesion. Dealing with a lesion in the rectum vs a lesion in the colon is very different, as rectal lesions are easier to access with endoscopic submucosal dissection (ESD) compared with colonic lesions. The third feature that needs to be evaluated is the gross morphology of the lesion. For laterally spreading tumors, for example, there are different subtypes, including granular, nongranular, nodular, mixed nodular, and depressed lesions. Every lesion has a different risk of submucosal invasion, especially, for example, depressed or nodular ones. The endoscopist also needs to examine the mucosal and vascular patterns using virtual chromoendoscopy, like narrow-band imaging (NBI) and magnification endoscopy. Several classifications can be applied such as the Japan NBI Expert Team classification, NBI International Colorectal Endoscopic classification, and Kudo classification. They will provide information about the risk of cancer. Depending on all those features, one must consider whether to choose an en-bloc resection or whether it is possible to perform a piecemeal resection.

G&H Can you summarize the basic steps for the main resection techniques for large polyps?

AS The resection steps are quite different depending on the technique chosen. With endoscopic mucosal resection (EMR), a first step is a submucosal injection, and then basically a snare is used to resect the mucosa. For lesions that are smaller than 2 cm, an en-bloc resection is possible; however, for lesions greater than 2 cm, usually a piecemeal resection is performed. Several adjacent techniques may be used like thermal ablation of the resection margins to reduce the recurrence rate.

For ESD, the resection procedure is different. The procedure starts with the marking of the lateral margins of the lesion. This is usually accomplished by coagulation. The lesion is then injected, and the mucosa is incised using an electrocautery knife. There are several variants of the basic technique that include submucosal tunneling and traction techniques. However, the classic technique is to perform a circumferential incision and then continue with the submucosal dissection to achieve an en-bloc resection.

An endoscopic full-thickness resection (EFTR) procedure is generally performed with the full-thickness resection device (FTRD) in the colon and in the rectum. The first step in EFTR is, again, marking of the lesions, which is also done with coagulation dots. Then the endoscope is extracted from the patient. The FTRD system is mounted onto the endoscope, which is then advanced to the lesion. At this point, a grasping forceps is advanced through the working channel of the endoscope. The lesion is then pulled into the cap and an over-the-scope clip is deployed. Finally, the tissue above the clip is resected with the snare, which is integrated in the distal end of the cap.

G&H How effective is EMR or ESD compared with EFTR for large polyps?

AS It basically depends on how effectiveness is defined. In terms of complete resection of large polyps, I think all 3 techniques are highly effective, and the rates of complete resection are very similar and well above 90%. However, there is a difference in terms of recurrence rate. It is known, for example, that with piecemeal EMR, the recurrence rates are up to 20%. New modifications of the technique such as EMR with margin ablation have reduced the recurrence rate, and with these modern techniques, the rate is lower at about 5%. Regardless, piecemeal resection carries a higher risk of recurrence compared with the en-bloc techniques. For ESD, the recurrence rate is indeed very low, about 1% to 2%, in current studies. For EFTR, good long-term data are not available yet, but short-term data indicate that the recurrence rates are about 12% to 15%.

EMR is considered to be the standard technique even for large nonpedunculated polyps, according to the guidelines.

G&H What are the advantages and disadvantages of conventional vs full-thickness resection techniques for large polyps?

AS EMR is considered to be the standard technique even for large nonpedunculated polyps, according to the guidelines. This is because it is a highly effective and very simple technique. The EMR technique is very easy to learn, and the procedure duration is quite short, whereas the ESD procedure is very time-consuming and technically much more difficult and much harder to learn. However, ESD has an advantage over EMR in that it is an en-bloc procedure, so it is effective for removing submucosal invasive lesions, for example, and, as I mentioned, has low recurrence rates.

EFTR is not directly comparable to EMR or ESD because it is used for lesions (eg, nonlifting recurrent lesions or small early carcinomas) that are difficult to address with the other techniques. Compared with EMR, EFTR has the advantage that it is an en-bloc procedure.

Compared with EMR and ESD, EFTR also has the advantage that it is a full-thickness technique, so it is not restricted to the submucosa; the whole thickness of the colonic wall is excised. Therefore, the technique allows histopathologic assessment of the full thickness of the colonic wall, which is helpful for evaluation and staging of malignant lesions.

G&H How do the adverse events associated with these techniques differ, and how are the main adverse events typically managed?

AS Compared with the other techniques, EMR has probably the lowest rates of adverse events, especially concerning perforation, which is the most feared adverse event in resection. The perforation rates are below 1% if EMR is performed well. There is a risk of delayed bleeding in EMR, which is about 6% to 7%, but usually episodes of bleeding can be managed well endoscopically. For ESD, because the intervention is more complex, there is a higher risk of perforation, especially in the colon, and the risk of perforation is reported to be in the range of about 5% to 6%, so a little bit higher compared with EMR. However, perforations from ESD usually can be managed endoscopically.

For EFTR, there is also a risk of perforation. The rate of perforation is about 2% to 3%, which is slightly lower compared to ESD. However, a perforation is generally larger and the consequence of a perforation after EFTR is more serious because about 50% of cases need surgical treatment. There is also a risk of delayed perforations, which is luckily very low; however, delayed perforations are quite severe because they also usually require surgery.

Immediate perforations during endoscopic resections are usually closed with clips. For small perforations, the standard through-the-scope clips can be used, and for larger perforations, use of over-the-scope clips is a well-established method to avoid surgery.

G&H What training is required to perform EMR, ESD, or full-thickness resection?

AS There is, as far as I know, no international guideline recommendations in terms of training for these techniques. Again, EMR is quite easy to learn compared with ESD. At my hospital, typically trainees start with smaller lesions, then proceed to larger lesions, and after about 6 to 12 months of structured trainings, they are usually able to perform EMR for superficial lesions up to about 3 cm. ESD is a complex procedure, and the learning curve is very long. The training is much more time-consuming and must be more structured. Usually, trainees start with

animal models and then progress to small lesions under close supervision of an experienced endoscopist. Although some countries have training programs for ESD, there is no common consensus on how the training should be conducted or on the number of procedures needed until the endoscopist is considered confident in ESD.

EFTR, which is not easy but less complicated than ESD, is much easier to learn. An endoscopist with profound experience in colonoscopy and good EMR skills will be quickly able to learn the procedure. There is a 1-day training program offered by the device company, where endoscopists can train in porcine ex-vivo models and usually directly afterward can start performing real procedures in their hospitals. International registries have shown that EFTR has rapidly gained entrance into clinical practice after introduction of the device, which is different from ESD.

G&H What considerations should the endoscopist be aware of when using these techniques for large polyps, and what can help ensure complete resection?

AS The first step is to choose the right resection technique depending on the characteristics of the lesion. The second thing endoscopists need to be aware of is their own endoscopic skills. Especially for procedures like ESD, I would recommend only performing that when there is profound experience and a sufficient caseload in the institution. Of course, one needs to consider the equipment that is available in the department. EFTR and ESD, for example, require special equipment. The nursing staff needs to be properly trained because assistance during the procedures is important. The more complex the resection, the more important it is to have a backup for complications, which can occur. The endoscopist needs to be able to deal with complications endoscopically (eg, perforation closure and hemostasis). It is also important to have a surgical partner who can manage complications on a 24/7 basis.

In terms of ensuring completeness of the resection, again, it is important to choose the right technique, to have sufficient endoscopic skills, and to be aware of the margins of the lesion before the procedure. After the resection, it is, of course, important to observe the resection site very closely and to look for residual remnants of the lesion.

G&H How will resection techniques for large polyps likely improve in the future?

AS Endoscopists will probably be better able to choose a more tailored approach for resection of polyps. For example, EMR will likely become more tailored depending on the lesion characteristics. The more data that become available from clinical studies, the more it will be clear when to use a cold snare, when to use a hot snare, when a margin ablation is necessary, and so on.

Another improvement, in my view, will be further development of existing devices. There will also probably be new devices, which will enable endoscopists to perform more efficient resections and to simplify resection procedures, especially ESD. One unsolved problem in ESD is countertraction of the tissue. Several techniques have been proposed to address this, including rubber bands and clipping systems. There are novel devices in development that allow, for example, bimanual manipulation of tissue. There is also currently some development on robotic flexible endoscopy. All of these may become available in the future.

Disclosures

Professor Schmidt has received lecture fees and study grants from Ovesco Endoscopy and lecture fees from Olympus.

Suggested Reading

- Belderbos TDG, Leenders M, Moons LMG, Siersema PD. Local recurrence after endoscopic mucosal resection of nonpedunculated colorectal lesions: systematic review and meta-analysis. *Endoscopy*. 2014;46(5):388-402.
- Cronin O, Bourke MJ. Endoscopic management of large non-pedunculated colorectal polyps. *Cancers (Basel)*. 2023;15(15):3805.
- Jacques J, Schaefer M, Wallenhorst T, et al. Endoscopic en bloc versus piecemeal resection of large nonpedunculated colonic adenomas: a randomized comparative trial. *Ann Intern Med*. 2024;177(1):29-38.
- Meier B, Stritzke B, Kuellmer A, et al. Efficacy and safety of endoscopic full-thickness resection in the colorectum: results from the German Colonic FTRD Registry. *Am J Gastroenterol*. 2020;115(12):1998-2006.
- Schmidt A, Beyna T, Schumacher B, et al. Colonoscopic full-thickness resection using an over-the-scope device: a prospective multicentre study in various indications. *Gut*. 2018;67(7):1280-1289.
- Sidhu M, Shahidi N, Gupta S, et al. Outcomes of thermal ablation of the mucosal defect margin after endoscopic mucosal resection: a prospective, international, multicenter trial of 1000 large nonpedunculated colorectal polyps. *Gastroenterology*. 2021;161(1):163-170.e3.
- Zwager LW, Mueller J, Stritzke B, et al; Dutch eFTR Working Group and German collaborating centers. Adverse events of endoscopic full-thickness resection: results from the German and Dutch nationwide colorectal FTRD registry. *Gastrointest Endosc*. 2023;97(4):780-789.e4.