

## Core curriculum for EMR and ablative techniques

*This document was prepared by the American Society for Gastrointestinal Endoscopy (ASGE) Training Committee. This curriculum document contains recommendations for training, intended for use by endoscopy training directors, endoscopists involved in teaching endoscopy, and trainees in endoscopy. It was developed as an overview of techniques currently favored for the performance and training of EMR and other GI mucosal ablative techniques such as cryotherapy and radiofrequency ablation (RFA). By serving as a guide to published references, videotapes, and other resources available to the trainer, the ASGE strives to continually improve teaching and performance of EMR and mucosal ablative techniques.*

Acquiring the skills to perform EMR and GI mucosal ablative techniques requires a thorough understanding of the histology and pathology of the GI tract, indications, technical performance, risks, and limitations of the procedures. Trainees should be proficient in general endoscopy with exceptional technique in upper endoscopy, colonoscopy with polypectomy, and hemostasis. Trainees should also be competent in managing the potential complications that may occur involving these procedures, such as bleeding (including clipping, injection, and thermal treatment), perforation (including closure of perforations with clips or other devices), and stricture formation (including dilation and temporary stent placement).<sup>1</sup>

EMR is usually performed in the luminal GI tract for premalignant and early superficial malignant lesions of the esophagus, stomach, duodenum, colon, and rectum.<sup>2</sup> Commonly used ablative techniques include argon plasma coagulation (APC), cryotherapy, and RFA. Cryotherapy has been used in the esophagus, stomach, and rectum.<sup>3-7</sup> RFA has primarily been used for esophageal dysplastic lesions or early-stage malignancy.<sup>8-12</sup> Other ablative techniques have also been used throughout the luminal GI tract, including photodynamic therapy and multipolar electrocautery.<sup>13-15</sup> To apply these procedures safely and effectively, it is important for trainees to have a mastery of the anatomy of the entire GI tract. Thus, curriculum-based training should aid in achieving competence and optimal patient outcomes when performing these procedures.

### GOALS OF TRAINING

Trainees must eventually learn and achieve competence in these techniques through direct hands-on learning. The optimal setting requires trainees to fully evaluate patients referred for EMR and/or ablation. This includes performing the preprocedure assessment, obtaining informed consent, reviewing the risks and benefits thoroughly, performing the procedure under direct supervision, and managing the patients postprocedurally including management of any complications.<sup>16</sup> Trainees should have an understanding of the care of patients after EMR with regard to delayed bleeding, perforation, and pain management. The trainee should be familiar with the appropriate management of anticoagulation in the setting of a mucosal resection, taking into consideration the potential risk of delaying reinitiation of anticoagulants or antiplatelet agents.<sup>17</sup> Additionally, trainees need to clearly communicate the findings, treatment performed, postprocedure instructions, and follow-up recommended to the patient and family.

Regarding informed consent, trainees should be taught to explain to patients all of the potential complications of the specific procedure being recommended, including the advantages and disadvantages of the procedure compared with other management options. Trainees must understand the risks and benefits of various EMR and ablative techniques and be able to provide patients with a tailored risk assessment and informed consent. Additionally, a complete procedure log should be kept by all trainees for all of their procedures.

Additionally, all trainees should work closely with pathology services and understand GI tumor staging. Understanding the importance of the lateral and deep margins is critical in deciding whether further surgical or medical therapy is indicated. The pattern and risk of lymph node involvement with superficial tumors in different anatomic locations should be understood by all trainees. Counseling of patients and their families will rely heavily on the understanding of the pathology of the lesions.

### Faculty

There must be at least 1 full-time faculty member experienced in EMR and ablative techniques. The expert faculty must be dedicated to teaching these advanced procedures and have time available to instruct and evaluate the trainees. Assessment of trainees by qualified faculty should occur during (1) patient history taking, physical

examination, and consent process; (2) procedures; and (3) postprocedure management. Scheduled periodic assessment and evaluation of endoscopic, technical, and intellectual skills of each trainee is required. Other methods that can be used by faculty to evaluate each trainee include computerized logs, periodic patient care record reviews, and patient surveys.

## Facilities

Programs that offer training in EMR and ablative techniques should have sufficient volume so that trainees have enough experience to attain competence in these procedures. Trainees should be exposed to a heterogeneous mix of patients with varying comorbid conditions. Programs must have an objective-based curriculum and provide trainees with access to resources such as textbooks, DVDs, lectures, online material, and endoscopic courses with live demonstrations to assist in the education of trainees. Many EMR and ablative techniques can initially be performed on animal models. Institutions that provide advanced training should have the capability for mucosal enhancement technology (eg, high-definition endoscopy, narrow-band imaging, chromoendoscopy, laser confocal endomicroscopy, endocytoscopy). Training institutions do not need to have all the EMR and/or ablative techniques available, but trainees should be aware of the available techniques and modalities as well as the literature supporting each.

## Endoscopic experience

**EMR.** EMR involves the removal of dysplastic or superficial malignant lesions within the GI lumen.<sup>2,18-22</sup> Trainees should know the appropriate indications for EMR as well as the appropriate staging before performing these procedures. Some lesions may be more amenable to resection using endoscopic submucosal dissection, and understanding the differences in technique is important to management of these lesions. Trainees should be fully aware of the limitations of mucosal resection in different parts of the GI tract. Trainees need to be able to assess the area requiring EMR using high-resolution endoscopy, mucosal enhancement technology, and/or EUS. The assessment should include recognition of lesions that are not amenable to EMR, including findings that suggest unresectability that may be discovered during the procedure. Furthermore, marking the area to be resected using thermal marking or other techniques should be taught. Trainees should understand and be able to perform 1 or more of the various techniques currently used for EMR. The 2 systems currently available in the United States for EMR are a cap-assisted system and a band ligation–assisted system. The trainee should know the advantages of the oblique and straight caps in the various GI tract organs. The trainee should be able to assemble the device and troubleshoot technical problems arising during deployment. Further-

more, the technique of aspiration and resection specific to the device must be learned.

Trainees should be taught 1 or more of the techniques and available “lifting” solutions used to lift the mucosa and when this should be performed before EMR. The purported advantages of and contraindications to using certain tissue dyes (eg, methylene blue) in the mucosal lift solution should be understood. Trainees should become competent in assessing the resection site for evidence of large vessels requiring prophylactic treatment as well as in assessing whether there is evidence of perforation. Familiarity with the various types of retrieval baskets or nets used to capture the resected specimen(s) should be achieved. Trainees should also know the options for managing residual neoplastic tissue using a snare, APC, or other adjunctive techniques. Regardless of the type of EMR technique used, trainees should also gain proficiency in closing a mucosal defect caused by EMR by using clips or other closure devices. Trainees should coordinate and communicate with their pathology services to ensure appropriate handling of the specimens to ensure proper processing.

**RFA.** RFA is an ablative technique that is approved for the treatment of dysplastic Barrett’s mucosa. Trainees should know the evidence-based literature that supports the use of RFA in dysplastic Barrett’s esophagus.<sup>8-12,23</sup> Trainees should understand that RFA is not recommended for superficial cancers, so that during the endoscopic examination, consideration of EMR for any suspicious lesions, with histologic evaluation, should be performed before RFA. Additionally, trainees should review patients’ clinical condition, including results of all previous available endoscopic examinations, pathology, and imaging studies with the goal of determining the appropriateness of RFA treatment. The role of RFA after EMR of superficial cancers with remnant dysplastic mucosa should be understood by trainees.

Trainees should understand and become skilled in the technical equipment of RFA and be familiar with the available devices and accessories. Accurate measurement and characterization of Barrett’s mucosa, an understanding of the interpretation of sizing balloon measurements, choosing the appropriately sized treatment balloon, when and how to use the 60- and 90-degree device, use of a mucolytic agent before therapy, and removal of the eschar before a second ablation are all essential parts of this technique. Trainees should formulate a treatment plan based on the length of the BE and understand the risks of overlapping treatment areas. Trainees should be aware of the potential side effects and complications of RFA, including perforation in the presence of esophageal strictures or after EMR.

Trainees should be well versed in the aftercare for patients undergoing RFA including the need for potent acid suppression, diet, and adequate pain control.

**Cryotherapy.** Cryotherapy is an ablative technique that uses cryogenic gas to freeze metaplastic, dysplastic,

and malignant tissues within the GI lumen. Compared with RFA, cryotherapy has been less widely studied for dysplastic and superficial cancers of the esophagus.<sup>8</sup>

Two different cryotherapy systems are available for use, and trainees should be familiar with the type of cryogen and delivery system used in their practice environment.<sup>3-7,24-32</sup> Accurate assessment of the mucosa along with an understanding of the mucosal changes observed during cryotherapy are all essential parts of this technique. Trainees should learn the dosimetry for freezing normal and abnormal tissue. They should have an understanding of the duration and number of freeze and thaw cycles required to ablate mucosa and be able to continually assess their patients for excessive insufflation. Trainees must have a thorough understanding of the thermodynamics of cryotherapy, the operation of the equipment, the techniques used, and the various equipment models available to perform cryotherapy. Familiarity with the decompression tubes needed for removal of cryogen from the hollow gut is essential. Trainees should appreciate the early and late complications associated with cryotherapy. In particular, trainees should be knowledgeable in the aftercare for patients undergoing cryotherapy including the need for potent acid suppression, diet, and adequate pain control.

**Photodynamic therapy.** Trainees should be familiar with the current literature that supports the use of photodynamic therapy (PDT) in the management of luminal GI dysplastic and cancerous lesions. Before its use, trainees should be able to accurately identify and assess the lesion endoscopically and with various imaging techniques. Understanding the importance of directing the light at the targeted neoplastic tissues is paramount. Trainees wishing to become proficient in PDT need to understand the physics of PDT, the mechanism of action, the operation of the equipment, the techniques used, and the various equipment models available. Trainees should be aware of the various photosensitizers available, the dose of the agent, the power settings, and the duration of exposure to light. Additionally, trainees should be able to manage patients before, during, and after the PDT session. Trainees should fully understand the expected success rates of PDT and the main complications, which include chest pain, strictures, and photosensitivity reactions. Maintaining adequate nutrition, hydration, and pain control after PDT is essential to successful ablation.

**Adjunctive ablative techniques.** APC is not routinely used for primary ablation but may be useful as adjunctive ablative modalities. With the use of APC, trainees should be aware that organs with thinner walls, such as the small bowel and right colon, will require low power settings and flow rates. Thicker-walled organs, such as the stomach and rectum, permit the use of higher power settings and flow rates for ablation of neoplastic tissue or bleeding lesions.<sup>31</sup> Trainees should recognize the potential problems that may arise from APC including overinsufflation and mucosal contact with the probe tip. Trainees should

be aware of the requirement of a full bowel cleanse before colonic APC.

Various APC systems are available for use, and trainees should be familiar with the generator used in their practice environment. The power settings (in watts), argon flow rates (L/min), and various spray modes should be chosen based on the location in the GI tract and desired depth of tissue destruction, and trainees should become comfortable at independently selecting settings based on these factors. Trainees may refer to the ASGE Technology Review in 2008 for settings of mucosal ablative devices.<sup>31</sup>

Less commonly used methods of mucosal ablation in clinical practice that trainees may be exposed to include multipolar electrocautery, heat probe, and laser therapy.<sup>31</sup>

## TRAINING PROCESS

Trainees should have mastery of diagnostic endoscopy, standard polypectomy, injection, and hemostasis techniques before receiving training in EMR and ablative techniques. If trainees develop proficiency in the first 2 years of fellowship, the third year may provide an opportunity for a fellow to reach competence in EMR and ablative techniques. There is also an opportunity to be trained in EMR and ablative techniques during a fourth year in advanced endoscopy training.

Trainees should have an appropriate balance of clinical patient care, didactics, and research exposure during their training in EMR and ablative techniques. Optimizing skills by repetition of the technique at hand and refinement of procedural dexterity are paramount. Performing a procedure too infrequently may lead to missed or inappropriate diagnoses with potentially significant consequences.<sup>33</sup> Integration of clinical cases requiring EMR and/or ablative techniques into weekly conferences with radiology, pathology, and surgery services is helpful regarding interdisciplinary care.

Trainees are expected to read current textbooks and monographs, relevant scientific literature, and distributed syllabus materials. Didactic training should incorporate the staging and pathophysiology of GI cancers, with attention to the issues related to regional lymph node metastases. Trainees must expand their knowledge of EMR and ablative techniques through seminars, postgraduate courses, and annual scientific meetings of the major digestive diseases societies. Participation in quality assurance, continuous quality improvement programs and systems-based programs is integral to this effort.

In addition to the patient care, trainees are encouraged to participate in clinical and/or basic research related to EMR and ablative techniques. The opportunity to formally study the elements of study design, decision analysis, outcomes and effectiveness research, statistics, epidemiology, and other skills necessary to conduct and evaluate clinical investigation should be available.

## ASSESSMENT OF TRAINING

Formal evaluations of each trainee's endoscopic skills should be obtained, as outlined by the ACGME core competencies.<sup>33</sup> No set number of EMR and/or ablative procedures has been recommended for competency during fellowship, so endoscopic trainers will need to determine this based on the trainee's individual performance and demonstration of necessary skills in these advanced techniques. Objective criteria of competence should be developed and met. Using these Accreditation Council for Graduate Medical Education core competencies as an objective guideline for verbal and written feedback will allow each training program an established method of documentation and will aid trainees in future credentialing. The trainee must receive appropriate and timely feedback on EMR and ablative skills throughout the training experience, including formative and summative evaluations in patient care, medical knowledge, interpersonal and communication skills, professionalism, and practice-based learning and improvement, and system-based practice.

### Patient care

Trainees must be able to provide patient care that is appropriate, effective, and compassionate. This would include, but not limited to, the following: history taking, including family, genetic, psychosocial, and environmental histories, and the ability to perform a comprehensive and accurate physical examination. The ability to arrive at an appropriate differential diagnosis, outline a logical plan for specific and targeted investigations pertaining to the patient's symptoms, and formulate a plan for management and possible follow-up treatment using successive EMR and/or ablative sessions is critical. Review of all diagnostic and/or therapeutic endoscopic options shall also be included. Trainees should be able to present the results of each consultation orally and in writing and to defend any recommendations for diagnostic and/or therapeutic endoscopy, including EMR and any ablative techniques mentioned previously. Expertise in providing informed consent is essential.

### Medical knowledge

Trainees must demonstrate a core fund of knowledge in gastroenterological physiology, pathophysiology, radiology, and surgery. Trainees must be able to demonstrate an analytic approach and use appropriate investigations, including the practice of evidence-based medicine, to support any recommended use of EMR and/or ablative techniques.

### Interpersonal and communication skills

Trainees must be able to demonstrate interpersonal and communication skills that result in effective information exchange with their patients, families, and other health care professionals. This would include, but not limited to, verbal and written communication as a consultant. Endo-

scopic reports should be accurate and timely, describing in detail how EMR or any ablative technique was performed. Trainees must be able to work effectively as members and leaders of the health care team.

### Professionalism

Trainees must understand and be committed to all elements of professionalism, including respect, compassion, and integrity toward patients and their family and toward other health care professionals. Trainees must demonstrate ethical behavior, responsiveness, and sensitivity to a diverse sex, ethnic, socioeconomic, and aging patient population.

### Practice-based learning and improvement

Trainees must be able to investigate, evaluate, and improve their patient care practice by analyzing and assimilating both scientific evidence and their own previous endoscopic experience of EMR and ablative techniques into their practices. They should be able to critically appraise clinical studies and be able to use information technology to support their own education. They must be involved in teaching and be able to facilitate the learning of other students and health care professionals in EMR and ablation.

### System-based practice

Trainees must demonstrate an understanding of, awareness of, and responsiveness to the larger context and system of health care delivery. Trainees should understand how their patient care and endoscopic practice affects other health care professionals, including surgeons, oncologists, pathologists, and radiologists who may also be involved in each patient's care. Trainees should practice cost-effective health care when using the more expensive ablative techniques without compromising quality of care for their patients. The trainee should be able to advocate for timely, quality patient care and know how to partner with other health care providers to provide the optimal health care for their patients.

## DISCLOSURE

*Dr Adler, consultant for Boston Scientific Corporation, BEE, and Merit; Dr Shami, consultant for Olympus America; Dr McHenry, consultant for Conmed Endoscopic Technologies and Boston Scientific Corporation, Honorarium from Cook Endoscopy; Dr DiMaio, consultant for Boston Scientific Corporation and Olympus America. All other authors disclosed no financial relationships relevant to this publication.*

*The authors disclosed no financial relationships relevant to this publication.*

*Abbreviations: APC, argon plasma coagulation; PDT, photodynamic therapy; RFA, radiofrequency ablation.*

## REFERENCES

1. American Society for Gastrointestinal Endoscopy. Methods of granting hospital privileges to perform gastrointestinal endoscopy. *Gastrointest Endosc* 2002;55:780-3.
2. American Society for Gastrointestinal Endoscopy Technology Committee, Kantsevoy SV, Adler DG, Conway JD, et al. Endoscopic mucosal resection and endoscopic submucosal dissection. *Gastrointest Endosc* 2008;68:11-8.
3. Johnston M, Schoenfeld P, Mysore J, et al. Endoscopic spray cryotherapy; a new technique for mucosal ablation in the esophagus. *Gastrointest Endosc* 1999;50:86-92.
4. Pasricha PJ, Hill S, Wadwa KS, et al. Endoscopic cryotherapy: experimental results and first clinical use. *Gastrointest Endosc* 1999;49:627-31.
5. Johnston MH. Cryotherapy and other newer techniques. *Gastrointest Endosc Clin N Am* 2003;13:491-504.
6. Johnston MH, Eastone JA, Horwhat JD, et al. Cryoablation of Barrett's esophagus: a pilot study. *Gastrointest Endosc* 2005;62:842-8.
7. Johnston LR, Johnston MH. Cryo spray ablation (CSA) in the esophagus: Optimization of dosimetry. *Am J Gastroenterol* 2006;101(Suppl 2):S532.
8. Fleischer DE, Odze R, Overholt BF, et al. The case for endoscopic treatment of non-dysplastic and low-grade dysplastic Barrett's esophagus. *Dig Dis Sci* 2010;55:1918-31.
9. Shaheen NJ, Sharma P, Overholt BF, et al. Radiofrequency ablation in Barrett's esophagus with dysplasia. *N Engl J Med* 2009;360:2277-88.
10. Fleischer DE, Overholt BF, Sharma VK, et al. Endoscopic ablation of Barrett's esophagus: a multicenter study with 2.5-year follow-up. *Gastrointest Endosc* 2008;68:867-76.
11. Sharma VK, Wang KK, Overholt BF, et al. Balloon-based, circumferential, endoscopic radiofrequency ablation of Barrett's esophagus: 1-year follow-up of 100 patients. *Gastrointest Endosc* 2007;65:185-95.
12. Ganz RA, Overholt BF, Sharma VK, et al. Circumferential ablation of Barrett's esophagus that contains high-grade dysplasia: a U.S. multicenter registry. *Gastrointest Endosc* 2008;68:35-40.
13. Tanaka T, Matono S, Nagano T, et al. Photodynamic therapy for large superficial squamous cell carcinoma of the esophagus. *Gastrointest Endosc* 2011;73:1-6.
14. Pech O, Gossner L, May A, et al. Long-term results of photodynamic therapy with 5-aminolevulinic acid for superficial Barrett's cancer and high-grade intraepithelial neoplasia. *Gastrointest Endosc* 2005;62:24-30.
15. Keeley SB, Pennathur A, Gooding W, et al. Photodynamic therapy with curative intent for Barrett's esophagus with high grade dysplasia and superficial esophageal cancer. *Ann Surg Oncol* 2007;14:2406-10.
16. Freeman ML. Training and competence in gastrointestinal endoscopy. *Rev Gastroenterol Disord* 2001;1:73-86.
17. Eisen GM, Baron TH, Dominitz JA, et al; American Society for Gastrointestinal Endoscopy. Guideline on the management of anticoagulation and antiplatelet therapy for endoscopic procedures. *Gastrointest Endosc* 2002;55:775-9.
18. Shami VM, Villaverde A, Stearns L, et al. Clinical impact of conventional endosonography and endoscopic ultrasound-guided fine-needle aspiration in the assessment of patients with Barrett's esophagus and high-grade dysplasia or intramucosal carcinoma who have been referred for endoscopic ablation therapy. *Endoscopy* 2006;38:157-61.
19. Stein HJ, Feith M, Mueller J, et al. Limited resection for early adenocarcinoma in Barrett's esophagus. *Ann Surg* 2000;232:733-42.
20. Sharma P. Barrett's esophagus. *N Engl J Med* 2009;361:2548-56.
21. Sayana H, Wani SB, Keighley JD, et al. Endoscopic mucosal resection (EMR) as a diagnostic tool in Barrett's esophagus (BE) patients with high-grade dysplasia (HGD) and early esophageal adenocarcinoma (EAC): a systematic review [abstract]. *Gastroenterology* 2008;134:A-724.
22. Seewald S, Ang TL, Soehendra N. Endoscopic mucosal resection of Barrett's oesophagus containing dysplasia or intramucosal cancer. *Postgrad Med J* 2007;83:367-72.
23. Spechler SJ, Sharma P, Souza RF, et al. American Gastroenterological Association Medical Position Statement on the management of Barrett's Esophagus. *Gastroenterology* 2011;140:1084-91.
24. Halsey KD, Greenwald BD. Cryotherapy in the management of esophageal dysplasia and malignancy. *Gastrointest Endosc Clin N Am* 2010;20:75-87.
25. Shaheen NJ, Greenwald BD, Peery AF, et al. Safety and efficacy of endoscopic spray cryotherapy for Barrett's esophagus with high-grade dysplasia. *Gastrointest Endosc* 2010;71:680-5.
26. Greenwald BD, Dumot JA, Abrams JA, et al. Endoscopic spray cryotherapy for esophageal cancer: safety and efficacy. *Gastrointest Endosc* 2010;71:686-93.
27. Greenwald BD, Halsey KD. Spray cryotherapy in esophageal disease. *US Gastroenterol Hepatol Rev* 2009;5:54-7.
28. Dumot JA, Vargo JJ, Falk GW, et al. An open-label, prospective trial of cryospray ablation for Barrett's esophagus high-grade dysplasia and early esophageal cancer in high-risk patients. *Gastrointest Endosc* 2009;70:635-44.
29. Cash BD, Johnston LR, Johnston MH. Cryospray ablation (CSA) in the palliative treatment of squamous cell carcinoma of the esophagus. *World J Surg Oncol* 2007;5:34.
30. Flores A, Reicher S, Chung D, et al. Barrett's esophagus eradication by radiofrequency and cryospray ablation. *Am J Gastroenterol* 2009;104(Suppl 3):S10.
31. Rodriguez SA, Adler DG, Chand B, et al. Mucosal ablation devices. *Gastrointest Endosc* 2008;68:1031-42.
32. Greenwald BD, Dumot JA, Horwhat JD, et al. Safety, tolerability, and efficacy of endoscopic low-pressure liquid nitrogen spray cryotherapy in the esophagus. *Dis Esophagus* 2010;23:13-9.
33. Position statement. Maintaining competency in endoscopic skills. American Society for Gastrointestinal Endoscopy. *Gastrointest Endosc* 1995;42:620-1.

---

Developed by the TRAINING COMMITTEE 2010-2012

Gordon C. Hunt, MD  
 Walter J. Coyle, MD  
 Shireen A. Pais, MD  
 Douglas G. Adler, MD  
 Barry DeGregorio, MD  
 Christopher J. DiMaio, MD  
 Kulwinder S. Dua, MD  
 Brintha K. Enestvedt, MD  
 Linda S. Lee, MD  
 Lee McHenry, Jr., MD  
 Daniel K. Mullady, MD  
 Elizabeth Rajan, MD  
 Robert E. Sedlack, MD  
 Vanessa M. Shami, MD  
 William M. Tierney, MD  
 Ashley L. Faulx, MD, Chair

This document is a product of the ASGE Training Committee. This document was reviewed and approved by the Governing Board of the ASGE.

---