

Contents

Foreword: Third Space Endoscopy: Expanding Therapeutic Power	xiii
Charles J. Lightdale	

Preface: Navigating a Path in Submucosal Endoscopy: Learning from the Past and Forging Ahead	xv
Amrita Sethi	

The Journey from Endoscopic Submucosal Dissection to Third Space Endoscopy	1
Haruhiro Inoue, Marc Julius H. Navarro, Yuto Shimamura, Mayo Tanabe, and Akiko Toshimori	

With the advent of endoscopic submucosal dissection, a variety of endoscopic devices including knives and high-frequency electrosurgical unit have become available. In addition, the concept of natural orifice transluminal endoscopic surgery pushed flexible endoscopic surgery ahead. In this review, the birth of peroral endoscopic myotomy and its expansion into the field of submucosal endoscopy are reviewed.

East versus West: Comparisons and Implications in Adaptation to Practice	7
Dennis Yang, Muhammad K. Hasan, and Peter V. Draganov	

Endoscopic submucosal dissection (ESD) is the preferred strategy for the resection of large superficial neoplasia throughout the gastrointestinal tract in Asian countries. The transition of ESD to the West has been slower because of various regional and training differences. Nonetheless, over the past couple of decades, the steady growth of ESD mentors in the West and the introduction of viable training pathways and dedicated devices and accessories have led to the increasing adoption of ESD and other third space endoscopic procedures.

Building the Toolbox of Devices to Optimize a Practice in Submucosal Endoscopy	15
Rahil H. Shah and Sunil Amin	



A video of double-clip traction method used during rectal ESD accompanies this article at <http://www.giendo.theclinics.com>.

Endoscopic submucosal dissection (ESD) is a technically complex and still evolving procedure. As a result, there are many advances in the technology and tools available to assist the endoscopist. This article delves into the various tools developed for ESD including electrosurgical knives, caps, injection agents, and traction devices. The authors discuss tools available as well as their respective pros, cons, and technical considerations for use. Overall, the choice of tools depends on a multitude of factors from availability, cost, lesion characteristics, and the endoscopist's familiarity and proficiency.

Understanding the Principles of Electrosurgery for Endoscopic Surgery and Third Space Endoscopy

29

Andrew A. Li, Margaret J. Zhou, and Joo Ha Hwang

Electrosurgery is the application of high-frequency electrical alternating current to biologic tissue to cut, coagulate, desiccate, and/or fulgurate. Electrosurgery is commonly used in gastrointestinal endoscopy, with applications including biliary sphincterotomy, polypectomy, hemostasis, the ablation of lesions, and endoscopic surgery. Understanding electrosurgical principles is important in endoscopic surgery to achieve the desired therapeutic effect, optimize procedural outcomes, and minimize risks or adverse events. This article describes fundamental principles that apply to electrosurgical units, operator technique, and practical considerations for achieving desired tissue effects in endoscopic surgery; and provides practical guidance and safety considerations when using electrosurgical units in endoscopic surgery.

Training in Endoscopic Submucosal Dissection in the United States: The Current Paradigm

41

Cem Simsek and Hiroyuki Aihara

Endoscopic submucosal dissection (ESD) training in Japan is pursued through a designated master-apprentice, organ-based stepwise training model. However, applying a similar program to the United States is not a practical strategy due to the significant differences in the training system and disease prevalence. To incorporate the ESD training into the current advanced endoscopy fellowship program, the use of recently developed techniques and technologies to improve the efficiency of ESD is ideal. The ESD training program in the United States should be prevalence-based, with increased involvement of trainees depending on their objectively assessed competency levels.

Endoscopic Submucosal Dissection in the Esophagus: Indications, Techniques, and Outcomes

55

Norio Fukami

Endoscopic submucosal dissection (ESD) is well-accepted endoscopic resection modality for esophageal lesions with benefits in certain situations. ESD offers potential cure for early esophageal cancer and detailed pathologic information for risk stratification. Techniques are mostly standardized, and the use of traction method is encouraged. Indication and proper techniques of ESD in esophageal disease and clinical outcomes will be discussed in this article with pearls for care planning and management during periprocedural period.

Endoscopic Submucosal Dissection in the Stomach and Duodenum: Techniques, Indications, and Outcomes

67

Sarah S. Al Ghamdi and Saowanee Ngamruengphong

Gastric endoscopic submucosal dissection (ESD) is established for management of early gastric cancer (EGC). Diagnosis of EGC relies on adequate endoscopic assessment involving lesion size, histopathology, presence of ulceration, and depth of invasion. Absolute indications for

endoscopic resection of EGC are if patients are presumed to have a less than 1% risk of lymph node metastasis, endoscopic submucosal dissection, and long-term outcomes are similar to those with surgical gastrectomy. Duodenal ESD is more technically difficult and requires expertise in ESD in other locations.

Endoscopic Submucosal Dissection in the Colon and Rectum: Indications, Techniques, and Outcomes

83

Amyn Haji

Multimodal assessment of colorectal polyps is needed before decision-making for endoscopic mucosal resection or endoscopic submucosal dissection (ESD). Assessment should include morphology according to Paris classification, magnification endoscopy for vascular pattern, and Kudo pit pattern analysis. ESD should be offered to patients that have Villous pattern, lateral spreading tumors (LST) granular multinodular and LST nongranular, lesions with fibrosis and those in patients with inflammatory bowel disease. A defined strategy for resection and planning is crucial for successful and efficient resection with a clear audit of outcomes aiming for a perforation and bleeding rate of less than 1% and R0 resection greater than 90%.

Indications and Outcomes of Per Oral Endoscopic Myotomy from Mouth to Anus

99

Ashish Gandhi, Jay Bapaye, and Amol Bapaye

Third space endoscopy or submucosal endoscopy using a mucosal flap valve allows secure access to the submucosal and deeper layers of the gastrointestinal tract without the risk of a full-thickness perforation. This allows the performance of submucosal tunneling and myotomy for spastic segments of the gastrointestinal tract. Per oral endoscopic myotomy (POEM) has been described for the treatment of achalasia cardia and other spastic esophageal disorders and is widely implemented. Endoscopic pyloromyotomy (G-POEM) has been performed for the treatment of refractory gastroparesis. Z-POEM for Zenker's diverticulum, D-POEM for epiphrenic diverticulum, and per-rectal endoscopic myotomy for treatment of Hirschsprung's disease are described.

Peroral Endoscopic Myotomy Technique, from Mouth to Anus

127

Roberta Maselli, Marco Spadaccini, Gaia Pellegatta, and Alessandro Repici

The peroral endoscopic myotomy (POEM) procedure, as described over 10 years ago, is a submucosal endoscopy procedure that allows access to the muscle layers throughout the gastrointestinal (GI) tract. With this access, and ability to cut the muscle fibers, POEM can be performed not only for motility disorders but for structural pathology as well, such as Zenker diverticulum. Regardless of the location, there are 4 steps to the procedure: mucosotomy, submucosal tunneling, myotomy, and mucostomy closure. This review outlines these key components as well as variations in techniques for POEM throughout the GI tract.

Submucosal Tunneling Techniques for Tumor Resection 143

Zi-Han Geng, Ping-Hong Zhou, and Ming-Yan Cai

The concept of third space endoscopy is based on the principle that the deeper layers of the gastrointestinal tract can be accessed by tunneling in the submucosal space. The mucosal flap safety valve enabled endoscopists to use submucosal space securely. The era of third space endoscopy has expanded to treat various gastrointestinal disorders, such as mucosal lesions, SMTs, extraluminal tumors, achalasia, and others. Third space endoscopy emerged as a minimally invasive alternative to conventional surgery. Our review focused on the indications, techniques, clinical management, and adverse events of submucosal tunneling techniques for tumor resection.

Nontunneling Full Thickness Techniques for Neoplasia 155

Grace E. Kim, Shivangi Kothari, and Uzma D. Siddiqui

Colorectal cancer is the third most common cancer worldwide and the fourth leading cause of cancer-related deaths in the world, second in the United States. Although most lesions are managed surgically especially when they have already invaded into the submucosal layer, endoscopic full-thickness resection (EFTR) has become an emerging technique that can serve as a safe and effective alternative management for locally invasive gastrointestinal cancers. This article discusses the indications and various techniques and limitations of nontunneled EFTRs of gastrointestinal cancer and reviews the current literature on the outcomes of EFTR.

Endoscopic Closure: Tools and Techniques 169

Thomas R. McCarty and Pichamol Jirapinyo

The rapid expansion of third space endoscopy has necessitated development of innovative endoscopic defect closure devices and techniques. This article discusses commonly used endoscopic closure devices and techniques, data on their safety and efficacy, and a description of the authors' own practice patterns.

Management of Adverse Events of Submucosal Endoscopy 183

Manu Venkat and Kavel Visrodia

The risk–benefit profile of submucosal endoscopic procedures is generally favorable but there exist unique considerations regarding the recognition, treatment, and prevention of submucosal endoscopic complications. Bleeding during the procedure can be managed with knife electrocautery, tamponade by injection of additional submucosal agent, or hemostatic forceps, depending on the location and degree of bleeding. Delayed bleeding should be managed with repeat endoscopy. Potential means to reduce the risk of delayed bleeding include anticipatory coagulation of visible vessels in the dissection ulcer base, applied hemostatic chemicals, snares, clips, and sheets of cultured cells.

A Look into the Future of Endoscopic Submucosal Dissection and Third Space Endoscopy: The Role for Robotics and Other Innovation

197

Philip Wai-yan Chiu, Siran Zhou, and Zhiwei Dong



Video content accompanies this article at <http://www.giendoclinics.com>.

Endoscopic resection has been widely applied especially in endoscopic submucosal dissection and third space endoscopy (TSE). Flexible endoluminal robotics allow performance of endoscopic submucosal dissection with exposure of the submucosal plane for precise dissection using two robotic arms. The introduction of TSE revolutionized the horizon of therapeutic endoscopy to the submucosal space beneath and beyond the mucosa. Advantages of TSE include avoidance of full thickness incision in gastrointestinal tract through the submucosal tunneling for performance of peroral endoscopic myotomy and submucosal tunneling endoscopic resection. In future, robotic-driven devices should be developed to enhance performance of complex endoluminal procedures and TSE.