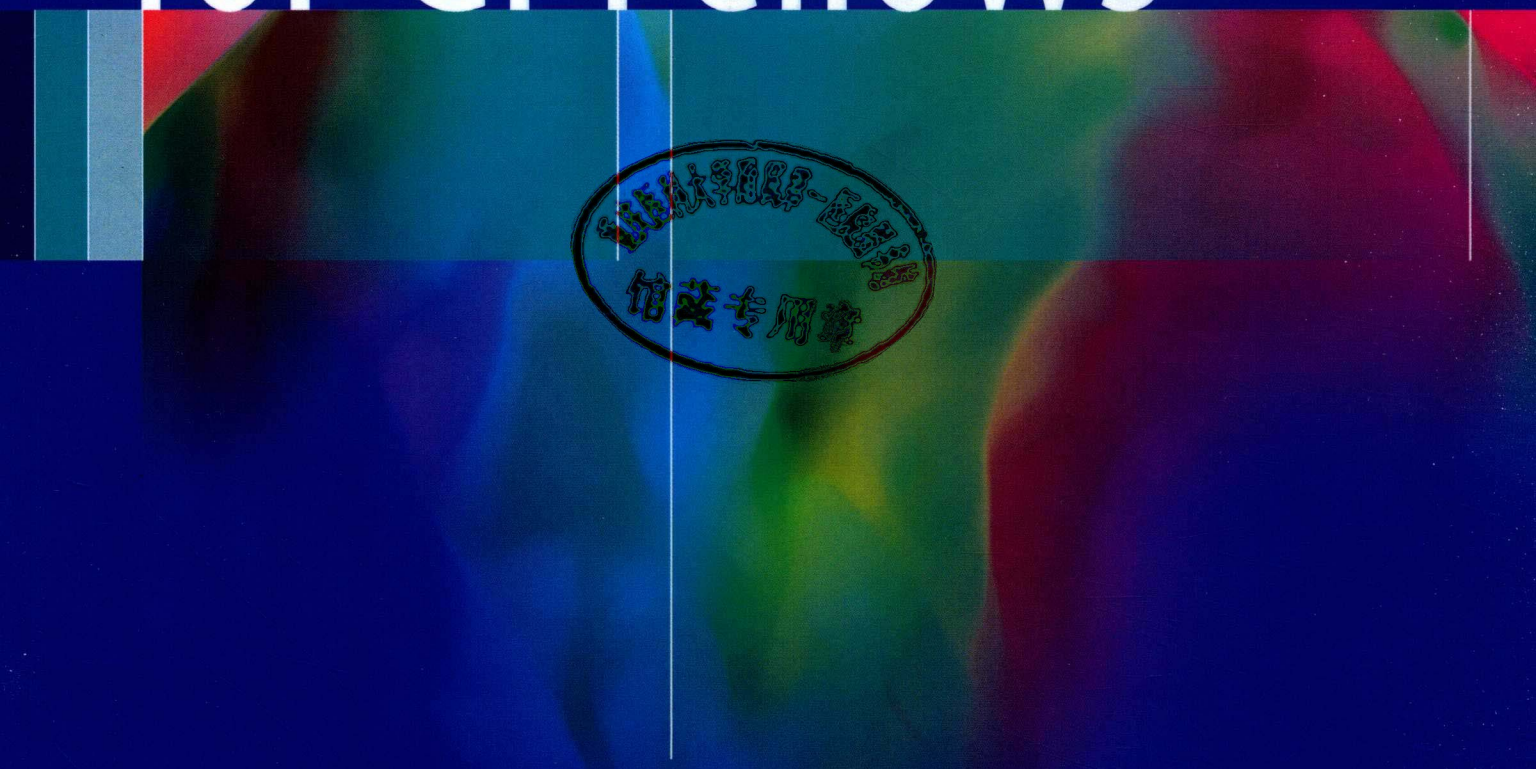
Douglas G. Adler
Editor

Upper Endoscopy for GI Fellows



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Videos can also be accessed at
https://link.springer.com/book/10.1007/978-3-319-49041-0

ISBN 978-3-319-49039-7 ISBN 978-3-319-49041-0 (eBook)
DOI 10.1007/978-3-319-49041-0

Library of Congress Control Number: 2016959544

Printed on acid-free paper

This Springer imprint is published by Springer Nature
The registered company is Springer International Publishing AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

For most practicing endoscopists, an esophagogastroduodenoscopy (EGD) is the first endoscopic procedure they ever perform. I distinctly remember the very first EGD I ever did as a first-year GI fellow, and the tremendous excitement and anticipation I felt walking into the procedure room for the first time. I was unused to the constricting feel of my gown, gloves, and mask, but was excited to be wearing them. "I'm here," I thought, "I made it." I had already familiarized myself with the endoscope handle and the operation of the control heads and buttons, and was ready to go. After a few minutes of verbal instruction from my attending physician, I was handed the endoscope, the patient was sedated, and we were off. The examination passed uneventfully (for both the patient and myself!) and I remember thinking afterward, "that was so easy!"

Indeed, upper endoscopy (as EGD is sometimes referred to) is deceptively simple. The anatomy is often straightforward and simple to navigate with an upper endoscope, and the foregut is very forgiving to novice endoscopists. It is hard to get lost or disoriented, and simple maneuvers can help you achieve important endoscopic and clinical goals. Like most GI fellows, I soon discovered that there was more to performing an excellent upper endoscopy than simply advancing the endoscope to the duodenum, and that not all examinations were as easy as my first. Variations in anatomy range from simple to highly complex, and mucosal abnormalities could either be overtly pathologic or maddeningly subtle and hard to detect. It quickly became apparent that I needed to learn to recognize and be able to navigate a whole host of postsurgical reconstructions, some of which are commonly encountered and other less so. Some bleeding sources were readily apparent, other defied even the most detailed and careful examination. Some causes of upper abdominal pain were found quickly and easily, others not so much. Despite the steep learning curve and the long hours and late nights involved, this was an exciting journey.

As with most things endoscopic, the more you learn the more you realize you do not know. The depth and breadth of pathology and endoscopic interventions that can be encountered and performed during the course of an upper endoscopy are almost too numerous to count. As months became years, I always found that there was something new to discover in an upper endoscopy; some new illness to identify and some new maneuver to perform. In addition, as my endoscopic skills grew, the range of diagnostic and therapeutic maneuvers I became comfortable performing also grew. Even to this day, 17 years after my first EGD as a GI fellow, I am still adding new diagnostic and therapeutic interventions to my armamentarium. I suspect this trend will continue for as long as I am in practice and new tools and techniques continue to be developed.

I created this book as a handy resource for beginning endoscopists, but my goal is not to produce a book *just* for beginners. My goal was to produce a volume that would be useful all the way through ones training, covering the fundamentals of upper endoscopy (such as how to perform an upper endoscopy and how to treat upper GI bleeding) as well as more complex and involved interventions including the management of Barrett's esophagus, foregut strictures (both benign and malignant), submucosal lesions, complications (how to avoid them, and how to manage them when they happen), and other advanced topics. Each chapter includes many

high-quality endoscopic images to highlight key concepts. In addition, each chapter is supplemented with an endoscopic video to give the reader a video library of cases to learn from as well.

Everybody has to start somewhere, and that somewhere is usually an EGD! I hope you find this book to be a valuable tool as you start your endoscopic career.

Salt Lake City, UT, USA Douglas G. Adler, MD, FACG, AGAF, FASGE

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About the Editor

Douglas G. Adler, MD, FACG, AGAF, FASGE received his medical degree from Cornell University Medical College in New York, NY. He completed his residency in internal medicine at Beth Israel Deaconess Medical Center/Harvard Medical School, Boston, MA. Dr. Adler completed both a general gastrointestinal fellowship and a therapeutic endoscopy/ERCP fellowship at Mayo Clinic in Rochester, MN. He then returned to the Beth Israel Deaconess Medical Center for a fellowship in endoscopic ultrasound. Dr. Adler is currently a tenured Professor of Medicine and Director of Therapeutic Endoscopy at the University of Utah School of Medicine in Salt Lake City, UT. Dr. Adler is also the GI Fellowship Program Director at the University of Utah School of Medicine. Working primarily at the University of Utah School of Medicine's Huntsman Cancer Institute, Dr. Adler focuses his clinical, educational, and research efforts on the diagnosis and management of patients with gastrointestinal cancers and complex gastrointestinal disease, with an emphasis on therapeutic endoscopy. He is the author of more than 300 scientific publications, articles, and book chapters. This is Dr. Adler's sixth textbook on gastroenterology.

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Contents

How to Perform a High-Yield Esophagogastroduodenoscopy

1

Thiruvengadam Muniraj and Douglas G. Adler

Introduction

Esophagogastroduodenoscopy (EGD) provides excellent visualization of the mucosal surfaces of the esophagus, stomach, and proximal duodenum. Performing a high-quality EGD not only includes competence in the procedure with minimal patient discomfort, ensuring the appropriate identification of normal and abnormal findings, and performing therapeutic techniques, but also an understanding of the indications, risks, benefits, and limitations of the procedure. Acquiring the skills to perform upper endoscopy safely, effectively, and comfortably requires a solid understanding on what to look for during the endoscopy. In the past years, quality metrics in health care has been given more importance and various societies have come up with specific quality metric guidelines. This chapter will review how to perform a high-yield upper endoscopic examination. The authors recognize that there are wide variations in practice, but hope to demonstrate examples of good practice in many of the most commonly encountered clinical situations.

Pre-Procedure Management

A good knowledge of pertinent clinical history, indications, contraindications, pertinent past health history (which includes GI surgical history), patient exam findings, issues of informed consent, complications expected, patient education, antibiotic prophylaxis, and anticoagulation management is required prior to starting the endoscopic procedure.

Patient should be informed of and agree to the procedure and the administration of sedation/anesthesia, after discussion of its benefits, risks, and limitations and possible alternatives.

Sedation and Anesthesia

The level of sedation used for an EGD ranges from no sedation, minimal or moderate sedation, and up to deep and general anesthesia. In general, most upper endoscopic procedures are performed with the patient under moderate sedation, a practice that was formerly referred to as "conscious sedation," with complex procedures or high-risk patients often being examined under general anesthesia. With moderate sedation, the patient, while maintaining respiratory and cardiovascular function, is able to make purposeful responses to verbal or tactile stimulation. While deeper sedation and general anesthesia is administered by anesthesiologists or nurse anesthetists, moderate sedation is generally administered by the endoscopist with the assistance of a RN. Therefore, good knowledge of pharmacologic profiles of sedative agents and skills necessary to resuscitate a deeply sedated patient is warranted to perform endoscopy effectively and safely.

According to American Society of Anesthesiologist (ASA) guidelines, the patient should be fasting at least 2 h after consuming clear liquids and at least 6 h after consuming solids and non-clear liquids prior to the procedure [1].

When there are issues with administering sedation, selected patients may be able to undergo un-sedated endoscopic procedures using smaller caliber endoscopes (less than 6 mm, transnasal) and may tolerate well [2, 3].

Topical Pharyngeal Sprays

Topical pharyngeal sprays with lidocaine, tetracaine, and benzocaine are often used for during upper endoscopy, particularly during moderate sedation or un-sedated

Electronic supplementary material
Supplementary material is available in the online version of this chapter at 10.1007/978-3-319-49041-0_1. Videos can also be accessed at https://link.springer.com/chapter/10.1007/978-3-319-49041-0_1.

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D.G. Adler (ed.), *Upper Endoscopy for GI Fellows*,
DOI 10.1007/978-3-319-49041-0_1

procedures. While there are studies showing better patient tolerance with use of these sprays, the risk of aspiration is small but real. Also, methemoglobinemia and anaphylactic reactions are rare but serious complications of topical anesthetic sprays.

Indications

An EGD should be performed only if there is a clear indication, which implies a change in management is probable based on results of endoscopy, and/or after an empirical trial of therapy for a suspected digestive disorder has been unsuccessful, and/or as the initial method of evaluation as an alternative to radiographic studies and/or when a primary therapeutic procedure is contemplated [4] (see Table 1.1). However, specific alarm symptoms should prompt an EGD without other evaluation (see Table 1.2). EGD is generally contraindicated when a perforated viscus is known or suspected, unless the indication for the EGD itself is to *close* the perforation [4]. EGD is generally not indicated for evaluating symptoms considered to be functional in origin (though EGD may sometimes be needed to rule out an organic disease), and in patients with metastatic cancer when the results will not change the management.

Table 1.1 Common indications for EGD [4]

1. Upper abdominal symptoms that persist despite an appropriate trial of therapy
2. Upper abdominal symptoms associated with other symptoms or signs suggesting structural disease (e.g., anorexia and weight loss) or new-onset symptoms in patients older than 50 years of age
3. Dysphagia or odynophagia
4 Esophageal reflux symptoms that persist or recur despite appropriate therapy
5. Persistent vomiting of unknown cause
6 Other diseases in which the presence of upper GI pathology might modify other planned management. Examples include patients who have a history of ulcer or GI bleeding who are scheduled for organ transplantation, long-term anticoagulation, or nonsteroidal anti-inflammatory drug therapy for arthritis and those with cancer of the head and neck
7. Familial adenomatous polyposis syndromes
8. For confirmation and specific histologic diagnosis of radiologically demonstrated lesions: • Suspected neoplastic lesion • Gastric or esophageal ulcer • Upper tract stricture or obstruction
9. GI bleeding: • In patients with active or recent bleeding • For presumed chronic blood loss and for iron deficiency anemia when the clinical situation suggests an upper GI source or when colonoscopy does not provide an explanation
10. When sampling of tissue or fluid is indicated
11. Selected patients with suspected portal hypertension to document or treat esophageal varices
12. To assess acute injury after caustic ingestion
13. To assess diarrhea in patients suspected of having small-bowel disease (e.g., celiac disease)
14. Treatment of bleeding lesions such as ulcers, tumors, vascular abnormalities (e.g., electrocoagulation, heater probe, laser photocoagulation, or injection therapy)
15. Removal of foreign bodies
16. Removal of selected lesions
17. Placement of feeding or drainage tubes (e.g., peroral, percutaneous endoscopic gastrostomy, percutaneous endoscopic jejunostomy)
18. Dilation and stenting of stenotic lesions (e.g., with transendoscopic balloon dilators or dilation systems using guidewires)
19. Management of achalasia (e.g., botulinum toxin, balloon dilation)
20. Palliative treatment of stenosing neoplasms (e.g., laser, multipolar electrocoagulation, stent placement)
21. Endoscopic therapy of intestinal metaplasia
22. Intraoperative evaluation of anatomic reconstructions typical of modern foregut surgery (e.g., evaluation of anastomotic leak and patency, fundoplication formation, pouch configuration during bariatric surgery)
23. Management of operative complications (e.g., dilation of anastomotic strictures, stenting of anastomotic disruption, fistula, or leak in selected circumstances)

Table 1.2 Alarm symptoms prompting EGD

Unintentional weight loss
Dysphagia
Odynophagia
Hematemesis/Melena
Refractory acid reflux

Table 1.3 Identification of landmarks

Vocal cords/hypopharynx
Top of gastric folds
Z line
Greater and lesser curvature of stomach
Pyloric orifice
Duodenal bulb
Second part of duodenum
Post-surgical anatomy

Procedural Technique

It should be stressed that the technique advocated herein is not the only or ideal manner in which to perform an upper endoscopy, and individual techniques vary (Video 1.1).

The upper endoscope instrument controls consist of insertion section with optical system which is 9.2 mm in diameter, air/water buttons, a control head for left/right (small wheel) deflection, a control head for up/down deflection (big wheel), biopsy channel port (two ports in large therapeutic endoscopes), Narrow Band Imaging (NBI) or similar electronic enhancement button, and video/picture controls which can include zoom or near focus, depending on the instrument. Using the thumb, index, and middle fingers, most buttons and knobs can be controlled simultaneously with ease. Beginners should learn on how to set up the endoscopy cart, adjusting the light settings and connecting accessories such as heating probe or APC to an electrosurgical generator as needed.

Prior to starting endoscopy, the patient should be positioned in the left lateral decubitus position with the head of the bed elevated and a bite block should be inserted to allow the scope to pass through when the patient is sedated. The bite block protects the patient's teeth from the endoscope and protects the endoscope from the patient's teeth. Endoscopists should be familiar with intubating the esophagus in supine patients as this if often essential to the performance of upper endoscopy in ICU patients. Most EGD exams involve the identification of specific landmarks to ensure the completeness of the procedure (see Table 1.3).

Esophageal Intubation

The most challenging part of upper endoscopy for beginners is often the intubation of the esophagus. The intubation of esophagus should be done under direct visualization. The endoscope should, in general, not be advanced blindly or with undue force. In patients undergoing conscious sedation or in minimally sedated patients, sometimes it is useful to ask the patient to swallow when the scope enters the posterior pharynx to help relax the upper esophageal sphincter. Some endoscopists use the left index or middle finger to direct the scope into the posterior pharynx. Flexing the neck at this time may be useful to facilitate the endoscope passage to the posterior pharyngeal area.

Direct Visualization of Hypopharynx, Upper Esophageal Sphincter

The landmarks to guide entry into the upper esophageal orifice are present in and can be directly identified in the hypopharynx. In practice, this consists of visualizing the vocal cords and piriform sinuses and locating the upper esophageal sphincter (UES) just posterior to these. The UES is usually located 15–18 cm from the incisors, at the level of thyroid cartilage.

Despite adequate visualization of landmarks, occasionally it may difficult to intubate the UES, especially if the patient is inadequately sedated, or having issues with prominent cervical spine or neck mobility or has had prior head and neck surgery for oncologic issues.

Zenker's Diverticulum

During endoscopy, the presence of a Zenker's diverticulum often creates difficulty in UES intubation due to either compression of the normal esophageal lumen and/or obscuring the lumen from view. In addition, some patients have a prominent cricopharyngeal bar. It is prudent to consider and think about a possibility of a Zenker's diverticulum in elderly patients to reduce the risk of the procedure.

Examination of Esophagus

Under direct vision, the lumen of the esophagus is carefully visualized. This is done by insertion of the endoscope in the esophagus, along with air insufflation and direct observation. The scope can be gently torqued clockwise and anticlockwise manner to examine all the sides of the esophagus. Use of the tip deflection knobs is usually not necessary in the

esophagus, except when performing some interventions such as taking biopsies. The aortic pulsation is normally located approximately at 20–25 cm from the upper incisors.

Identifying the Gastroesophageal Junction (GEJ)/ Squamo-Columnar Junction/Z Line

In adults, the GEJ is typically located approximately 35-40 cm from the upper incisors. This is an important mark to remember. The location of the top of the gastric folds can be noted, and the distance from the GEJ to the upper incisors can be noted. The squamo-columnar junction is represented by the clear demarcation of the pale pearl colored esophageal mucosa to salmon pink gastric mucosa and called as "Z line." If salmon-colored pink mucosa extends cephalad from top of gastric folds, this suggests Barrett's esophagus.

Hiatal Hernia

Normally, the diaphragmatic hiatus squeezes the esophagus at or just below the GE junction. The position of the hiatus can be visualized by the contraction waist seen the lower esophagus, which is more easily observed when the patient sniffs or during deep breathing. A hiatal hernia is diagnosed if the Z line is more than 2 cm above the hiatus. Hiatal hernia also typically examined and confirmed during retroflexion in the stomach (see Fig. 1.1).

Examination of the Stomach

After esophageal evaluation, the endoscope is then passed into the lumen of the stomach itself. When patient is in left lateral position, this maneuver is usually easily accomplished. Intubation into the stomach is confirmed by identification of the characteristic rugal folds.

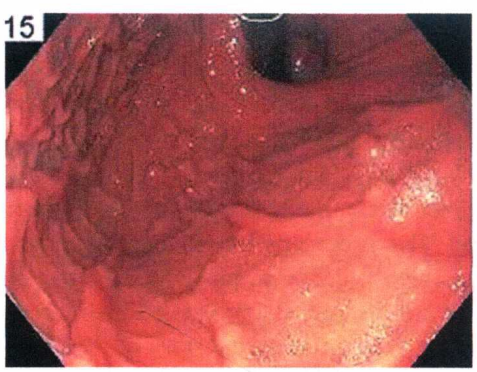

Fig. 1.1 Retroflexion in stomach

Identifying Lesser/Greater Curvature/Anterior/Posterior

Once the endoscope passes the GE junction, it usually enters the stomach along the lesser curvature, and the light shines on the greater curvature demonstrating the longitudinal rugal folds. The gastric wall to the left usually represents the anterior gastric wall, while the rightward stomach represents the posterior gastric wall.

Suction, Irrigation, and Air Insufflation

As a general rule, a good first thing to do after entering the stomach is to suction and remove any residual fluid in the fundus to reduce the risk of aspiration. Sometimes there may be retained food, blood, or mucus impairing mucosal visualization. A thorough water irrigation, with alternating suction helps to improve mucosal evaluation. Simethicone drops mixed in the water used for irrigation augment visibility by clearing gas bubbles or these can be washed away with a power flush, if available. Although air insufflation is necessary to distend the stomach for better visualization, too much air insufflation should be avoided as it may cause retching, vomiting, and even mucosal trauma from acute distension.

Examination of the Pylorus and Incisura

After suctioning, and optimally distending the stomach, the endoscope should be directed to the pylorus. The pylorus and the peri-pyloric area are examined carefully for any mucosal irregularities that would warrant biopsy or treatment. After slightly withdrawing from the pylorus, the tip is deflected upwards to examine the incisura angularis.

Examination of Gastric Body and Antrum

With an adequately distended stomach, the antrum and the body can then be carefully examined along both the lesser and greater curvatures, and along their anterior and posterior walls. The endoscope should be withdrawn almost up to the GE junction for a complete "long view" examination.

Retroflexion in the Stomach

After optimal distension of stomach with air, retroflexion is performed in order to view areas such as the fundus, cardia, and GE junction that otherwise would have limited tangential visualization during initial entry into the stomach. Also,

selective examination of the incisura angularis is frequently performed again in the retroflexed view. In retroflexion, the endoscope is rotated and using counterclockwise and clockwise rotation the entire GE junction, lesser curve, and gastric cardia can be examined effectively (see Fig. 1.1).

Pyloric Intubation

As in esophageal intubation, pyloric intubation should be performed under direct visualization without blind advancement. The pyloric channel is visualized easily by identifying the radiating gastric folds which converge to the pyloric orifice (see Fig. 1.2).

Intubation of the pylorus may be difficult at times, due to spasms (commonly) or the presence of pyloric stenosis (rarely). Sometimes an ulcer in the pyloric channel may make pyloric intubation difficult or can produce bleeding, which is usually limited. By using gentle air insufflation, the pylorus may be visualized and the scope tip is gently placed into the pyloric orifice and with slight pressure the endoscope usually easily passes through the duodenum.

Examination of the Duodenum

Duodenal Bulb

Once the pylorus is intubated, the duodenal bulb is visualized. The bulb is then identified immediately after entering the pyloric orifice, by appreciating the small-bowel-type mucosa. The bulb is often chamber-like and can appear somewhat cavernous even in a normal individual. The duodenal bulb should be carefully examined in anterior, posterior, medial, and lateral walls as lesion in this area can easily be missed. During evaluation of the duodenal bulb, the endoscope may sometimes fall back into the stomach, which is normal.

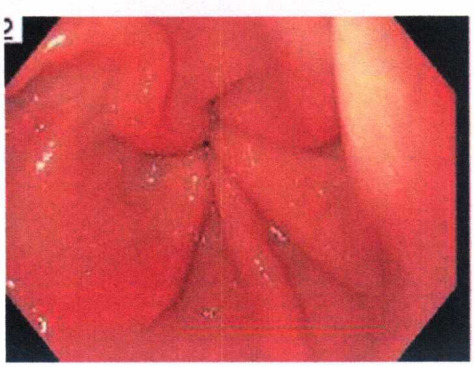

Fig. 1.2 Pyloric orifice with converging folds

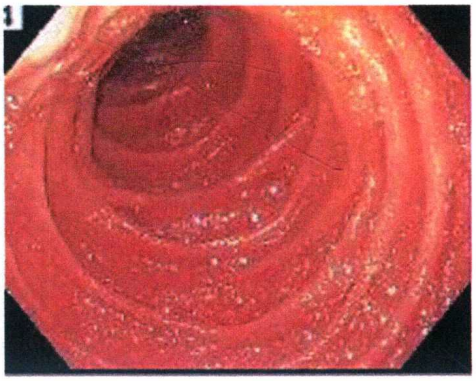

Fig. 1.3 Second part of duodenum

Second Portion of the Duodenum

The most common maneuver to pass around the duodenal sweep into the second portion of the duodenum involves flexing the tip of the endoscope by deflecting the tip upwards (coming back on the large wheel) while rotating the shaft of the endoscope clockwise. Once the scope is passed beyond the bulb, the concentric rings of circular duodenal folds are seen, which are known as the valves of Kerckring (also, valvulae conniventes). The folds projecting into the lumen of the small intestine serve as a landmark for the 2nd portion of the duodenum (see Fig. 1.3). Using torque maneuvers, the duodenal lumen is visualized and the scope is passed at least to the level just beyond the ampulla. Paradoxical motion on scope withdrawal at this level is useful to examine distal 2nd part of duodenum and the beginning of the 3rd duodenum. Limited exam of the ampulla can be performed, but in some patients the ampulla cannot be identified with a forward viewing scope even with careful attempts to do so (see Fig. 1.4). Care should be taken to withdraw very slowly along the duodenal sweep as the endoscope tends to fall out very quickly and lesion at the sweep may be missed.

Repeat Examination of Esophagus

Once the 1st and 2nd portion of the duodenum is examined well, the scope may be withdrawn back into the stomach. After withdrawing from the scope from the stomach, the endoscope should again be slowly withdrawn in the esophagus to carefully not to miss any subtle findings such as a gastric inlet patch (heterotopic gastric mucosa) [5] (see Fig. 1.5). Any lesion noted in the esophagus can be localized in relation to the centimeters from the upper incisors.

Examination of Larynx

Following complete examination of esophagus, the larynx and vocal cords can be examined on withdrawal as well if needed. This may be important especially when patient has symptoms of hoarseness of voice or severe GERD symptoms.

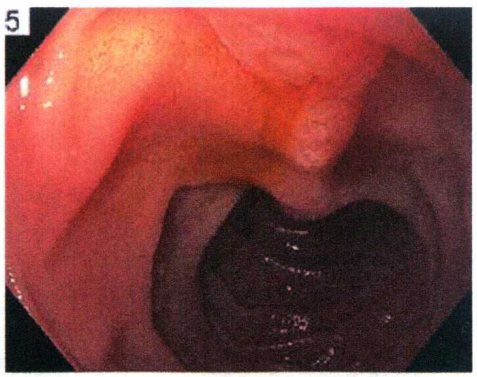

Fig. 1.4 Limited exam of the ampulla

Using a Side-Viewing Endoscope (Duodenoscope)

The lateral wall of the second portion of the duodenum as well as the ampulla can be difficult to examine effectively with regular forward viewing endoscope. Competence with passing the side-viewing endoscope may be helpful in situations when there is bleeding in the medial wall of the duodenum or when biopsy needs to be obtained from the ampulla or in patients with Familial Adenomatous Polyposis (FAP) who need to undergo careful duodenal surveillance for ampullary and non-ampullary adenomas.

Using Double-Channel Endoscopes and Therapeutic Channel Endoscopes

For selective therapeutic procedures, an endoscope with a dual-channel treatment capability may be very useful. The currently available T2 endoscopes have slightly larger outer diameter (12.6 mm), with two channels: one 3.7-mm-diameter channel and another 2.8-mm-diameter channel. This endoscope allows full suction capability with a single instrument loaded or simultaneous use of two endoscopic accessories instruments. There is a single larger channel (T1) endoscope with outer diameter 10 mm available which is often used when placing luminal stents as it has a larger channel (3.7 mm) when compared to regular endoscope (2.8 mm). The T1 endoscope is often referred to as a "therapeutic endoscope" as it is rarely used for diagnostic purposes. Therapeutic endoscopes or double-channel endoscopes are often used in patients with active upper gastrointestinal bleeding, in the performance of endoscopic mucosal resection, the placement of stents, or other interventional settings.

Using Ultra-Thin Endoscopes

In the presence of severe narrowing due to strictures, or performing diagnostic endoscopy in an un-sedated patient,

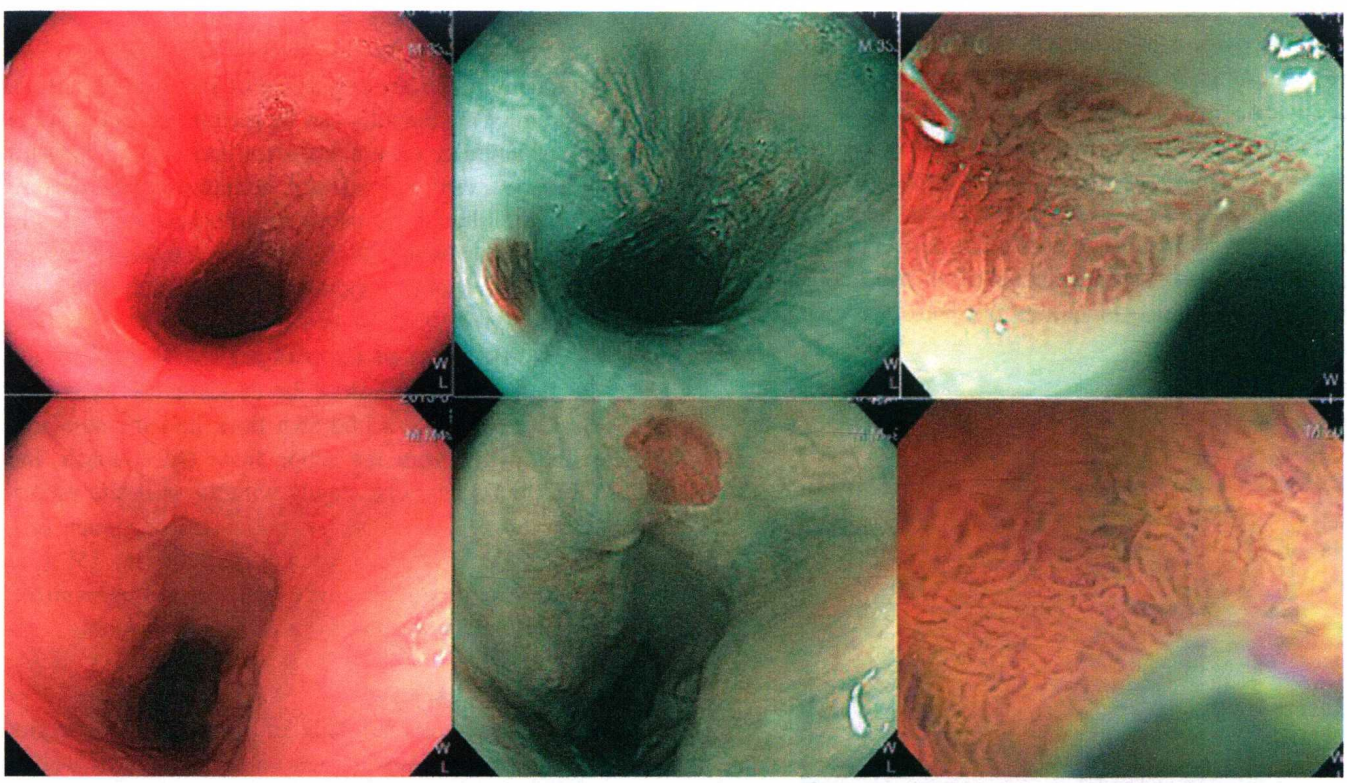

Fig. 1.5 Proximal esophagus with inlet patch seen under white light and NBI. From Ref. [5]

an ultra-slim endoscope may be used. The outer diameter of this scope is typically in the 5-mm range, and the channel port has an inner diameter of 2.2 mm. This endoscope can be passed via the transnasal route as well.

Identifying Abnormal Lesions

A clear understanding of normal anatomy and normal endoscopic findings of the esophagus, stomach, and duodenum is necessary prior to interpretation of abnormal endoscopic findings. Novice endoscopists should consider obtaining and referring to an endoscopic atlas frequency to familiarize themselves with the common appearance of a variety of with endoscopic findings (see Table 1.4). Repetitive exposure to a wide variety of endoscopic findings will help one to appreciate subtle findings and clearly delineate the normal from the abnormal.

Table 1.4 Some of the abnormal lesions to be familiarized in EGD

Esophagus
Zenker's diverticulum
Inlet patch
Esophagitis—Peptic, infectious, eosinophilic, pill induced
Schatzki ring
Esophageal stricture
Extrinsic compression of the esophagus
Esophageal tumors
MW tear
Esophageal varices
Hiatal hernia
Cameron lesion
Stomach
Erythema versus gastritis
Gastric cancer
MALToma
Dieulafoy lesion
Ulcers, erosions
GAVE
Gastropathy
Gastric varices
AVM
Submucosal lesions—GIST, Pancreatic rest, lipoma, pseudocyst
Duodenum
Ulcer
Ampullary adenoma or mass
Duodenal polyp(s)
Brenner's glands
Peri-ampullary diverticulum
Celiac villous atrophy

Biopsy—*When and Where to Take Biopsy*

Biopsy forceps should be deployed close to the tip of the endoscope so as to maximize mechanical advantage. Sometimes biopsies must be obtained at a significant distance from the tip of the endoscope, but this makes the maneuver much more difficult. After opening the forceps, applying a firm pressure on the target site, grab the tissue and snap the forceps back into the scope.

Esophagus

Esophageal biopsies can sometimes be difficult as the forceps are often parallel to the esophageal wall, as opposed to perpendicular (or nearly so) as in the rest of the GI tract. In the esophagus, biopsies can be facilitated by using the tip of the endoscope to drive the forceps into a position that is more *en face* to the mucosa. If just obtaining random biopsies of the esophagus (i.e., to rule out eosinophilic esophagitis in a patient with dysphagia), another option is to open the biopsy forceps over the target tissue, place it flush over the mucosa, and apply suction to collapse the lumen. This will generally allow sufficient mucosa to go into the biopsy forceps, which is then closed to capture the tissue.

Gastroesophageal Reflux Disease (GERD)

Biopsies directed to irregularities of the esophageal mucosa are rarely warranted in patients with GERD and esophagitis. Biopsies in an esophageal–gastric junction with inflammatory aspects are not recommended.

Reflux Esophagitis

Esophagitis from acid reflux is usually apparent in the distal esophagus at or near to the level of the GE junction. If the distal esophagus is normal with areas of esophagitis in the mid- or proximal esophagus, then these are less likely to be acid related. Longitudinal linear mucosal breaks, which if severe can be confluent and extend circumferentially or upwards are the findings in reflux esophagitis, are also rarely biopsied.

Eosinophilic Esophagitis (EoE)

EoE can be suspected in patients with a variety of findings including a narrow-caliber esophagus, a ringed esophagus, mucosal linear furrows, or white plaques. In patients with

suspected EoE, two to four biopsies of the proximal esophagus and two to four biopsies of the distal esophagus should be performed. Also, at the time of initial diagnosis, biopsies from gastric antrum and duodenum can be performed as needed to rule out other causes of esophageal eosinophilia and to exclude a more systemic process like eosinophilic gastroenteritis [6]. Some patients with suspected EoE should be treated with a 2-month course of proton pump inhibitor (PPI) prior to endoscopic biopsies to exclude PPI responsive esophageal eosinophilia (PPI-REE), although in practice many endoscopists biopsy the esophagus anytime the mucosa is suspicious for EoE [6].

Infectious Esophagitis

In patients with suspected infectious esophagitis, the site of biopsy varies according to the suspected etiology based on the morphology of the esophageal ulcerations. For suspected cytomegalovirus (CMV) esophagitis, biopsies should be taken from the base (center) of the ulcers. If patients have esophagitis suspected to be due to Herpes Simplex Virus (HSV), biopsies should be from the edges of the ulcers. Targeted biopsies and exfoliative cytology should be performed for suspected esophageal candidiasis.

Monilial (Candida) Esophagitis

Patients with white plaques in the esophagus often do not need to have a definitive biopsy obtained if the appearance is strongly suggestive of fungal infection. Typically, these patients are treated empirically with an oral antifungal, i.e., fluconazole. If a definitive sample is desired, either a biopsy or a brush cytology specimen is usually adequate to confirm the diagnosis (see Fig. 1.6).

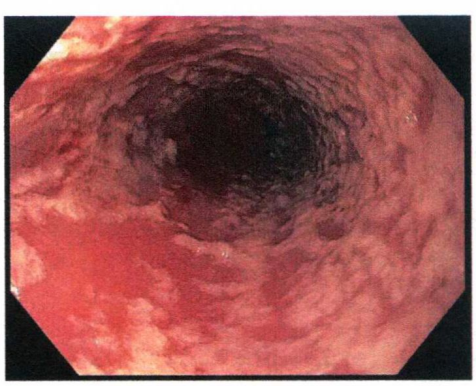

Fig. 1.6 Candida esophagitis

Barrett's Esophagus (BE)

BE should be considered when there is extension of salmon-colored mucosa into the tubular esophagus extending ≥ 1 cm proximal to the gastroesophageal junction (GEJ) with biopsy confirmation of intestinal metaplasia. Endoscopic biopsy should not be performed in the presence of a normal Z line or a Z line with only <1 cm of variability [7]. In patients with suspected BE, some have recommended at least 8 random biopsies should be obtained to maximize the yield of IM on histology. In patients with short (1–2 cm) segments of suspected BE in whom 8 biopsies may be unobtainable, at least 4 biopsies per cm of circumferential BE, and one biopsy per cm in tongues of BE, should be obtained [7]. The current GI society guideline recommend that endoscopic surveillance should employ four-quadrant biopsies at 2-cm intervals in patients without dysplasia and 1-cm intervals in patients with prior dysplasia, which is slightly more than the previously followed per Seattle protocol [8, 9] (see Fig. 1.7).

Stomach

Any concerning or suspicious gastric mucosal areas should typically be biopsied facilitate a diagnosis, be it for gastritis, malignancy, or other processes. Certain conditions like gastric antral vascular ectasia (GAVE), portal hypertensive gastropathy, angioectasias, and pancreatic rests are often diagnosed by the typical endoscopic appearance, and in these cases biopsies are rarely indicated [10] (see Fig. 1.8).

Dyspepsia

In patients undergoing EGD for dyspepsia as the sole indication, routine biopsies of normal-appearing esophageal mucosa or GE junction mucosa are generally discouraged. Conversely, biopsies of normal-appearing gastric mucosa for the detection of *Helicobacter pylori* (HP) infection, if the HP infection status is unknown, are recommended [11, 12].

Helicobacter Pylori

When obtaining biopsies from the gastric body and antrum for the detection of HP infection, the 5-biopsy Sydney System has been suggested for taking specimens from the lesser and greater curve of the antrum within 2–3 cm of the pylorus, from the lesser curvature of the corpus (4 cm proximal to the angularis), from the middle portion of the