Barrett's esophagus: Epidemiology, clinical manifestations, and diagnosis

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INTRODUCTION

Barrett's esophagus is the condition in which a metaplastic columnar epithelium that has both gastric and intestinal features replaces the stratified squamous epithelium that normally lines the distal esophagus. The condition develops as a consequence of chronic gastroesophageal reflux disease (GERD) and predisposes to the development of adenocarcinoma of the esophagus.

This topic will review the clinical manifestations and diagnosis of Barrett's esophagus. The pathogenesis, malignant transformation, and management of Barrett's esophagus, including surveillance for adenocarcinoma, are discussed separately. (See "Barrett's esophagus: Pathogenesis and malignant transformation" and "Barrett's esophagus: Surveillance and management".)

EPIDEMIOLOGY

Prevalence — Barrett's esophagus is usually discovered during endoscopic examinations of middle-aged and older adults; the large majority of cases go unrecognized [1]. The mean age at diagnosis of Barrett's esophagus is approximately 55 years [2]. Barrett's esophagus is uncommon in children in general and extremely rare in children under the age of five [3]. Barrett's esophagus is two- to threefold more common in men than in women [4].

In the United States it is estimated that as many as 5.6 percent of adults have Barrett's esophagus. However, estimates of the prevalence of Barrett's esophagus in the general population have varied widely ranging from 0.4 to more than 20 percent depending, in part, upon the population studied and the criteria used to establish the diagnosis [5-9].

In studies performed in the United States, Barrett's esophagus appears to have a higher prevalence in White individuals as compared with individuals who identify as being of Hispanic descent or Asian descent, and prevalence appears to be lowest in Black individuals [10,11]. The prevalence of short-segment Barrett's esophagus is substantially higher than long-segment Barrett's esophagus [12,13]. Both conditions are diagnosed more frequently in patients age 50 years and older. In a study that included 889 patients undergoing upper endoscopy who had protocol biopsies obtained at the esophagogastric junction [5], the overall prevalence of specialized intestinal metaplasia was 13.2 percent. The prevalence of long-segment and short-segment Barrett's were 6.4 and 1.6 percent, respectively. Intestinal metaplasia was limited to the gastroesophageal junction (GEJ) in 5.6 percent. (See 'Diagnosis' below and 'Intestinal metaplasia at GEJ' below.)

Although Barrett's esophagus traditionally has been considered uncommon in Asian countries [14], a meta-analysis of 51 studies that included 453,157 individuals in Asia revealed a surprisingly high pooled prevalence of histologically confirmed Barrett's esophagus (1.3 percent), which was short-segment in 82 percent of cases and may reflect misclassification error in some of the studies [15].

Risk factors

- **Gastroesophageal reflux disease (GERD)** – In patients with symptomatic GERD, erosive esophagitis is an independent risk factor for Barrett's esophagus, conferring a fivefold increased risk of Barrett's at five-year follow-up (relative risk ratio [RRR] 5.2, 95% CI 1.2-22.9) [16]. Some studies have suggested that patients with a peptic stricture have a higher prevalence of Barrett's esophagus than those without strictures. This relationship is not surprising since both peptic stricture and Barrett's esophagus are associated with more severe GERD. However, this association has been challenged in a study of patients referred for endoscopy for GERD in whom the prevalence of intestinal metaplasia was the same in patients with and without strictures [17].

- **Central (abdominal) obesity** – Central obesity is a risk factor for GERD and for Barrett's esophagus [18,19]. A 2009 meta-analysis that included 11 observational studies demonstrated a small increase in the risk of Barrett's esophagus in patients with a body mass index (BMI) >30 kg/m^2 as compared with patients with a BMI <30 kg/m^2 (odds ratio

[OR] 1.4, 95% CI 1.1-1.6) [18]. However, other studies have suggested that rather than BMI, abdominal obesity as measured by a high waist-to-hip ratio (≥0.9 in males and ≥0.85 in females) is especially associated with an increase in risk of Barrett's esophagus [19-22].

- **Family history** – Familial aggregation of Barrett's esophagus and esophageal adenocarcinoma has been described, and Barrett's esophagus has been found in up to 28 percent of first-degree relatives of patients with esophageal adenocarcinoma [23-25]. It is unclear if this is due to common environmental exposures and/or an inherited predisposition. Germline mutations in the *MSR1*, *ASCC1*, and *CTHRC1* genes have been associated with the presence of Barrett's esophagus and esophageal adenocarcinoma [26], and one large genome-wide association study identified genetic variants associated with Barrett's at chromosomes 6p21 and 16q24 [27]. Large cohort studies are needed to validate these findings [28].

- **Smoking** – Smoking appears to have a synergistic effect with GERD in increasing the risk of Barrett's esophagus. In a pooled analysis of five population-based case-control studies from the International BEACON (Barrett's Esophagus and Esophageal Adenocarcinoma Consortium), the risk of Barrett's esophagus was 1.7 times greater in smokers than in nonsmokers without GERD, and was 1.6 times greater than in nonsmokers with GERD [29].

Cancer risk — Esophageal adenocarcinoma in patients with Barrett's esophagus is thought to evolve through a sequence of genetic and epigenetic alterations that are associated with dysplastic changes of progressive severity. The incidence of cancer arising in Barrett's esophagus is described separately. (See "Barrett's esophagus: Pathogenesis and malignant transformation", section on 'Malignant transformation' and "Barrett's esophagus: Surveillance and management", section on 'Cancer risk'.)

CLINICAL FEATURES

The specialized intestinal columnar metaplasia typical of Barrett's esophagus causes no symptoms. Most patients found to have Barrett's esophagus are seen initially for symptoms of associated gastroesophageal reflux disease (GERD), such as heartburn or regurgitation. Patients with complications associated with Barrett's esophagus may have dysphagia or odynophagia from esophageal ulceration or stricture, and rarely gastrointestinal bleeding secondary to ulceration (picture 1) [2]. Although patients with long-segment Barrett's esophagus frequently have prominent GERD symptoms, short-segment Barrett's esophagus is not associated with GERD symptoms [30]. (See "Clinical manifestations and diagnosis of gastroesophageal reflux in adults".)

SCREENING PATIENTS FOR BARRETT'S ESOPHAGUS

Whom to screen — We screen for Barrett's esophagus in patients with multiple risk factors for adenocarcinoma. These include a hiatal hernia, age ≥50, male sex, chronic gastroesophageal reflux disease (GERD), White individuals, central obesity, cigarette smoking, and a confirmed history of Barrett's esophagus or esophageal adenocarcinoma in a first-degree relative [31,32]. In patients with erosive esophagitis found on the initial examination, we perform repeat endoscopy after a three-month course of acid suppression to exclude the presence of Barrett's esophagus.

In patients with a negative screening upper endoscopy for Barrett's esophagus, a routine follow-up upper endoscopy for screening for Barrett's esophagus is not indicated [31,33,34]. In a retrospective study of 24,406 patients with GERD who had an initial negative screening exam for Barrett's esophagus, only 2.3 percent had suspected Barrett's esophagus at the second upper endoscopy performed within five years [35].

Our recommendations are largely consistent with the American Gastroenterological Association (AGA) and American College of Gastroenterology (ACG) guidelines. Multiple societies have issued guidelines regarding screening patients for Barrett's esophagus [31,33,34,36]. It is important to appreciate that these recommendations represent the opinions of committees, that the recommendations of different societies vary, and that none of these approaches have been established effective in prospective clinical studies. However, these guidelines have limited ability to detect prevalent esophageal adenocarcinoma [37]. In a multicenter retrospective cohort study of 1308 patients with esophageal adenocarcinoma, up to 45 percent of patients with esophageal adenocarcinoma did not meet criteria for Barrett's esophagus screening [37]. Among patients with esophageal adenocarcinoma who did not meet screening criteria for Barrett's esophagus, a history of chronic reflux and obesity were among the two most common risk factors that were absent. (See 'Society guideline links' below.)

Upper endoscopy with biopsy — The sensitivity of endoscopy for detection of Barrett's esophagus is related to the length of involved mucosa, with detection being more likely in patients who have long-segment Barrett's esophagus [38]. In one study of 146 patients suspected of having Barrett's esophagus on endoscopic examination, the sensitivity and specificity of the endoscopists' diagnosis of Barrett's esophagus (using biopsy confirmation of the endoscopic diagnosis as the gold standard) were 82 percent (95% CI 72-92) and 81 percent (95% CI 78-84), respectively, and endoscopists diagnosed long-segment more accurately than short-segment Barrett's esophagus (55 percent versus 25 percent) [38]. In a study that included 116 patients who were involved in a Veterans Administration Cooperative Study that required

two endoscopies six weeks apart [39], Barrett's esophagus was confirmed by biopsy in only one of the two endoscopies in 20 percent of patients.

Endoscopic technique

Identify possible Barrett's — Barrett's esophagus should be suspected when the squamocolumnar junction is located ≥1 cm proximal to the gastroesophageal junction (GEJ) (figure 1). On white light endoscopy, Barrett's esophagus has a characteristic salmon-colored appearance.

- **Squamocolumnar junction (Z-line)** – Columnar epithelium has a reddish color and velvet-like texture on endoscopic examination, whereas squamous epithelium has a pale, glossy appearance (picture 2). The juxtaposition of these epithelia at the squamocolumnar junction forms a visible line called the Z-line.

- **Gastroesophageal junction (GEJ)** – The GEJ is the imaginary level at which the esophagus ends and the stomach begins anatomically. Endoscopists in the Western hemisphere typically identify the GEJ as the level of the most proximal extent of the gastric folds [31]. Air in the stomach should be aspirated during evaluation of the GEJ as air can flatten gastric folds. Occasionally, the esophagus can also form longitudinal folds and these folds should not be confused with gastric rugal folds.

In some Asian countries (particularly Japan), the GEJ is defined as the distal extent of the lower esophageal palisade vessels (rather than the upper end of the gastric longitudinal folds). Palisade vessels are identified endoscopically as fine, longitudinally-oriented blood vessels in the distal esophagus. However, one study found that using the palisade vessels had lower interobserver reliability than using the gastric folds as a landmark [40]. This method likely overcalls ultrashort-segment Barrett's esophagus.

Grade the extent — An endoscopic grading system (The Prague C & M Criteria) has been recommended for reporting the extent of Barrett's esophagus [31,41]. Measurements should be obtained during withdrawal of the endoscope when the shaft of the endoscope is straight. Distances assessed using centimeter measurements on the shaft of the instrument can be used to measure the distance of landmarks from the incisors more precisely.

- **Circumferential extent (C value)** – Depth of endoscope insertion at the GEJ – Depth of endoscope insertion from the circumferential extent of suspected columnar epithelium.

- **Maximum extent (M value)** – Depth of endoscope insertion at the GEJ – Depth of endoscope insertion from the maximal extent of columnar epithelium.

The Prague criteria have good interobserver reliability for Barrett's esophagus involving >1 cm of the distal esophagus [41,42].

Biopsy technique — Biopsies of the suspected Barrett's segment are needed to establish the diagnosis [43]. At least four biopsies should be obtained for every 2-cm segment of suspected Barrett's esophagus.

Biopsy specimens should not be obtained from a normal-appearing Z-line or irregular Z-line that extends <1 cm up the esophagus. If such biopsies are taken and identify intestinal metaplasia at the GEJ, there is yet no clear consensus on how to manage those patients, but their cancer risk generally is considered to be minimal. (See 'Histologic features' below and 'Intestinal metaplasia at GEJ' below.)

Histologic features — Traditionally, three types of columnar lining have been described in Barrett's esophagus [44]:

Gastric cardia type mucosa — Cardiac mucosa (also called cardia-type or junctional mucosa), which has a foveolar (pitted) surface and glands that are lined exclusively by mucus-secreting cells; these cells resemble normal gastric foveolar cells. Cardiac-type mucosa at the GEJ can be an abnormal, metaplastic lining acquired as a consequence of chronic inflammation in the distal esophagus caused by GERD. Gastric cardiac-type mucosa is characterized by columnar lining characterized by tortuous, tubular glands comprised exclusively of mucus-secreting cells and devoid of acid-secreting parietal cells [45,46]. While it was traditionally thought that cardiac-type mucosa can line up to 2 cm of the most distal esophagus, and may extend several centimeters below the GEJ to line the most proximal stomach (the gastric cardia), it is now known to usually extend only 1 or 2 mm beyond the Z-line [46,47]. Furthermore, some authorities now contend that the normal Z-line is a junction between esophageal squamous and gastric fundic (oxyntic) epithelia [48,49].

Studies also suggest that cardiac mucosa in the esophagus is not only often metaplastic, but also the precursor of specialized intestinal metaplasia in the esophagus. A study of 40 patients who had subtotal esophagectomy with esophagogastrostomy, an operation frequently complicated by severe reflux esophagitis in the esophageal remnant, supports the notion that cardiac-type mucosa is metaplastic [50]. Endoscopic examinations performed at a median of 36 months postoperatively showed that 19 of the 40 patients had developed columnar metaplasia in the esophageal remnant (10 cardiac-type, 9 intestinal metaplasia). Seven patients who had serial endoscopic examinations showed progression from cardiac-type mucosa on the initial postoperative endoscopy to specialized intestinal metaplasia on subsequent studies. The

median time to the development of cardiac-type mucosa was 14 months, whereas specialized intestinal metaplasia was found at a median of 27 months postoperatively.

Atrophic gastric fundic-type epithelium — Atrophic gastric fundic-type epithelium (also called oxyntocardiac epithelium), which has a foveolar surface lined by mucus-secreting cells, and a deeper glandular layer that contains chief and parietal cells; these cells resemble those in the gastric fundus.

Specialized intestinal metaplasia — Specialized intestinal metaplasia (also called specialized columnar epithelium or simply intestinal metaplasia) comprises a number of columnar cell types including goblet cells, gastric foveolar-type cells, small intestinal-like cells, and colonic-like columnar cells (picture 3A) [51]. Endocrine and Paneth cells have also been described (picture 4) [52]. It is the most common histologic type found in Barrett's esophagus, and the only one that has a clear malignant potential [13].

Specialized intestinal metaplasia can be indistinguishable histologically from intestinal metaplasia type II or III of the stomach. However, the presence of goblet cells is the most useful feature for distinguishing specialized intestinal metaplasia from cardiac mucosa. The goblet cells of specialized intestinal metaplasia contain acidic mucins (sialomucins and sulfomucins) that can be demonstrated by staining with Alcian blue (picture 3A-B). They may also contain colonic-like mucins that can be demonstrated with high-iron diamine staining (picture 5). (See 'Criteria for Barrett's esophagus' below and 'Gastric cardia type mucosa' above.)

Other methods

Novel endoscopic methods — Many endoscopic techniques have been used to enhance identification of Barrett's metaplasia, including magnification endoscopy, chromoendoscopy, optical coherence tomography, electronic chromoendoscopy (eg, narrow band imaging), and autofluorescence endoscopy. Routine use of advanced imaging techniques other than electronic chromoendoscopy generally is not recommended. (See "Barrett's esophagus: Surveillance and management" and "Barrett's esophagus: Evaluation with optical chromoscopy" and "Optical coherence tomography in the gastrointestinal tract", section on 'Barrett's esophagus' and "Chromoendoscopy", section on 'Barrett's esophagus' and "Confocal laser endomicroscopy and endocytoscopy", section on 'Barrett's esophagus'.)

Nonendoscopic methods — Nonendoscopic methods for screening are also being studied [53]. One method uses a device called a capsule sponge (Cytosponge, SurePath; BD Diagnostics, Durham, NC) combined with an immunohistochemical biomarker (trefoil factor 3) [54]. The patient ingests a gelatin capsule that is attached to a string and contains a compressed mesh. The mesh is exposed when the gelatin capsule dissolves in the stomach. The mesh is then

withdrawn through the esophagus where it collects samples of the cells lining the esophageal lumen. The biomarker is then used to differentiate Barrett's epithelial cells from gastric columnar and esophageal squamous cells.

In a study of 504 patients who had used acid-suppressing therapy for more than three months during the preceding five years, 501 (99 percent) were able to swallow the capsule [54]. The results obtained with the capsule sponge were compared with upper endoscopy for diagnosing Barrett's esophagus. The capsule sponge had a sensitivity of 73 percent and a specificity of 94 percent for patients with at least 1 cm of circumferential Barrett's esophagus. For patients with segments of 2 cm or more, the sensitivity was 90 percent and the specificity was 94 percent. Cytosponge-trefoil factor 3 (TFF3) appears to improve the detection of Barrett's, however, it has a high false-positive rate. In a randomized trial, 13,514 individuals with GERD were assigned to usual care with upper endoscopy for detection of Barrett's if deemed necessary by their clinician or intervention (Cytosponge-TFF3 procedure with subsequent upper endoscopy if positive) [55]. Of the 6834 individuals in the intervention group, 1654 underwent the Cytosponge procedure and 231 (3 percent) tested positive for TFF3. Of these, 221 individuals underwent endoscopy for positive TFF3 and 131 (59 percent) had Barrett's esophagus or esophageal cancer. During a mean follow-up of 12 months, rates of detection of Barrett's were significantly higher in patients in the intervention group as compared with usual care (absolute difference 18·3 per 1000 person-years [95% CI 14·8-21·8]; rate ratio 10·6 [95% CI 6·0-18·8]). In addition, nine (<1 percent) participants were diagnosed with dysplastic Barrett's esophagus or esophageal cancer in the intervention group, but there were no cases in the usual care group. Further studies are needed to determine which patient groups may benefit from screening and the cost-effectiveness of testing.

Limitations of screening — Long-segment Barrett's esophagus can be found in 3 to 5 percent of patients who have endoscopy for chronic GERD symptoms, and 10 to 15 percent have short-segment Barrett's esophagus [13]. However, it is not clear that screening patients with GERD symptoms reliably identifies all individuals at high risk for esophageal adenocarcinoma [56,57]. In addition, it is estimated that more than 40 percent of patients with esophageal adenocarcinoma have no history of heartburn and would not have qualified for screening.

Although patients with GERD symptoms are at increased risk for esophageal adenocarcinoma, the absolute risk of esophageal adenocarcinoma is low and it is not clear that screening has an impact on mortality [32,58].

It is also unclear that patients who are known to have Barrett's esophagus benefit from surveillance and, once the diagnosis of Barrett's esophagus has been established, patients are subject to the worry about the diagnosis, the inconvenience and risk associated with

surveillance and, potentially, a financial burden from an increase in life insurance premiums [59]. (See "Barrett's esophagus: Surveillance and management".)

DIAGNOSIS

The diagnosis of Barrett's is generally established by upper endoscopy and biopsy [13]. (See 'Upper endoscopy with biopsy' above.)

Criteria for Barrett's esophagus — The criteria for the diagnosis of Barrett's esophagus vary worldwide. In the United States, the diagnosis of Barrett's esophagus requires both of the following to be present:

- Columnar epithelium lining ≥1 cm of the distal esophagus.
- Histologic examination of biopsy specimens from that columnar epithelium must reveal intestinal metaplasia characterized with goblet cells.

In contrast, the British Society of Gastroenterology (BSG) also requires histologic proof of metaplastic esophageal columnar mucosa, but unlike United States guidelines, the BSG considers the finding of cardiac or oxyntocardiac mucosae (which do not contain goblet cells) to be adequate for a diagnosis of Barrett's esophagus. Some data suggest that gastric cardiac-type epithelium in the esophagus also might predispose to cancer and thus might be considered "Barrett's esophagus," but most authorities still require the presence of intestinal metaplasia for an unequivocal diagnosis [31,60]. (See 'Society guideline links' below and 'Gastric cardia type mucosa' above.)

Barrett's esophagus that is ≥3 cm in length is termed long-segment Barrett's, whereas a segment that is less than 3 cm is termed short-segment Barrett's esophagus [61].

Differential diagnosis

Intestinal metaplasia at GEJ — If the Z-line and the gastroesophageal junction (GEJ) coincide and biopsy specimens at the Z-line show intestinal metaplasia, the condition is called intestinal metaplasia at the GEJ [45].

Biopsy mapping of the body and antrum of the stomach can be useful to establish whether intestinal metaplasia at the GEJ is merely the proximal extension of a diffuse Helicobacter pylori (*H. pylori)* atrophic gastritis. Intestinal metaplasia can develop in the stomach as a consequence of chronic *H. pylori* gastritis. Histologically, intestinal metaplasia in the stomach can be indistinguishable from intestinal metaplasia in the esophagus. Since the GEJ cannot be

identified with great precision, it can be difficult to determine whether short segments of intestinal metaplasia found in the GEJ region are lining the esophagus (ie, short-segment Barrett's esophagus) or the proximal stomach. *H. pylori* infection rarely, if ever, causes intestinal metaplasia confined to the gastric cardia. Consequently, biopsy mapping of the body and antrum of the stomach can be useful to establish whether intestinal metaplasia at the GEJ is merely the proximal extension of a diffuse *H. pylori* atrophic gastritis. Without such mapping, however, it can be difficult to determine whether intestinal metaplasia at the GEJ represents an ultrashort segment of esophageal metaplasia or gastric intestinal metaplasia due to atrophic gastritis. The morphologic and histochemical features of gastric and esophageal intestinal metaplasia are similar, and the gross landmarks used to identify the GEJ do not have the precision necessary to localize a mucosa whose extent may be measured in only millimeters. In patients in Western countries, however, intestinal metaplasia at the GEJ usually is associated with GERD rather than with *H. pylori* infection [62].

Limited available data suggest that the esophageal cancer risk imposed by intestinal metaplasia at the GEJ in Western patients is minimal. In a population-based cohort study, subjects with intestinal metaplasia at the GEJ had substantially lower rates of progression to esophageal adenocarcinoma than those with clear-cut Barrett's esophagus (0 percent compared with 7 percent at 10 years) [63]. It seems likely that this low risk of cancer progression is because intestinal metaplasia at the GEJ in Western patients represent ultrashort-segment Barrett's esophagus rather than the extension of diffuse atrophic gastritis.

SOCIETY GUIDELINE LINKS

Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See "Society guideline links: Barrett's esophagus".)

INFORMATION FOR PATIENTS

UpToDate offers two types of patient education materials, "The Basics" and "Beyond the Basics." The Basics patient education pieces are written in plain language, at the 5th to 6th grade reading level, and they answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials. Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are written at the 10th to 12th grade reading level and are best for patients who want in-depth information and are comfortable with some medical jargon.

Here are the patient education articles that are relevant to this topic. We encourage you to print or e-mail these topics to your patients. (You can also locate patient education articles on a variety of subjects by searching on "patient info" and the keyword(s) of interest.)

- Basics topics (see "Patient education: Barrett's esophagus (The Basics)" and "Patient education: Upper endoscopy (The Basics)")
- Beyond the Basics topics (see "Patient education: Barrett's esophagus (Beyond the Basics)" and "Patient education: Upper endoscopy (Beyond the Basics)")

SUMMARY AND RECOMMENDATIONS

- Barrett's esophagus is the condition in which a metaplastic columnar epithelium that has both gastric and intestinal features replaces the stratified squamous epithelium that normally lines the distal esophagus. The condition develops as a consequence of chronic gastroesophageal reflux disease (GERD) and predisposes to the development of adenocarcinoma of the esophagus. (See 'Introduction' above.)
- Barrett's esophagus is usually discovered during endoscopic examinations of middle-aged and older adults; the large majority of cases go unrecognized. The mean age at diagnosis of Barrett's esophagus is approximately 55 years. (See 'Epidemiology' above.)
- The specialized intestinal columnar metaplasia typical of Barrett's esophagus causes no symptoms. Most patients found to have Barrett's esophagus are seen initially for symptoms of associated GERD, such as heartburn or regurgitation. Patients with complications associated with Barrett's esophagus may have dysphagia or odynophagia from esophageal ulceration or stricture, and rarely gastrointestinal bleeding secondary to ulceration. (See 'Clinical features' above.)
- Biopsies of the suspected Barrett's segment are needed to establish the diagnosis. At least four biopsies should be obtained for every 2-cm segment of suspected Barrett's esophagus. Biopsy specimens should not be obtained from a normal-appearing Z-line or irregular Z-line that extends <1 cm up the esophagus. If such biopsies are taken and identify intestinal metaplasia at the GEJ, there is yet no clear consensus on how to manage those patients, but their cancer risk appears to be minimal. (See 'Biopsy technique' above.)
- We screen for Barrett's esophagus in patients with multiple risk factors for adenocarcinoma. These include a hiatal hernia, age ≥50, male sex, chronic GERD, White individuals, central obesity, cigarette smoking, and a confirmed history of Barrett's

esophagus or esophageal adenocarcinoma in a first-degree relative. However, the evidence to support screening for Barrett's is weak, and the decision on when to recommend endoscopic screening should be individualized. (See 'Screening patients for Barrett's esophagus' above.)

- The criteria for the diagnosis of Barrett's esophagus vary worldwide. In the United States, the diagnosis of Barrett's esophagus requires both of the following to be present:
  - Columnar epithelium lining ≥1 cm of the distal esophagus.
  - Histologic examination of biopsy specimens from that columnar epithelium must reveal intestinal metaplasia characterized with goblet cells.

  In contrast, the British Society of Gastroenterology (BSG) also requires histologic proof of metaplastic esophageal columnar mucosa, but unlike United States guidelines, the BSG considers the finding of cardiac or oxyntocardiac mucosae (which do not contain goblet cells) to be adequate for a diagnosis of Barrett's esophagus. (See 'Diagnosis' above.)

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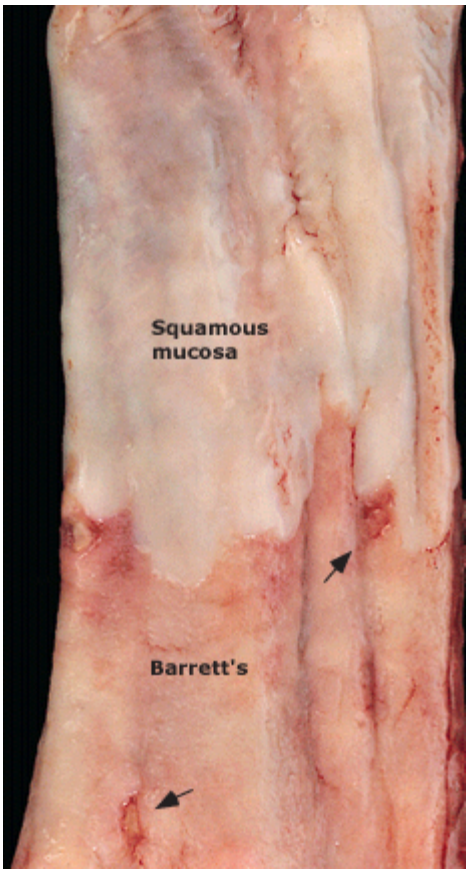
Topic 2269 Version 33.0

GRAPHICS

Barrett's esophagus

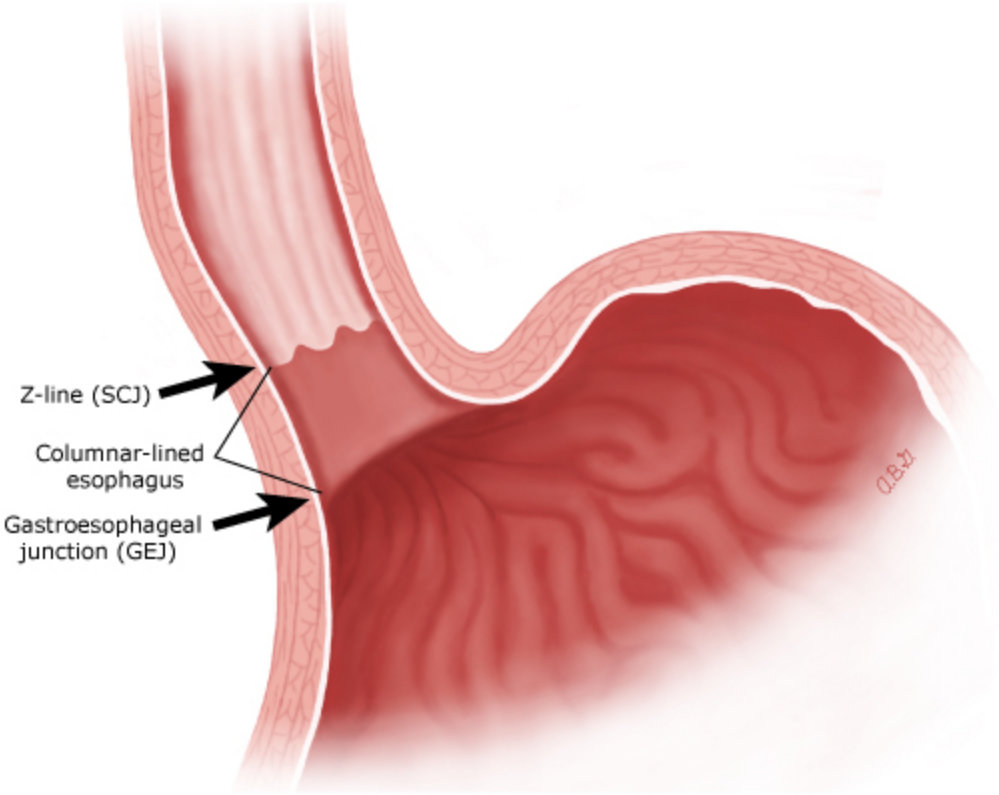


Esophagectomy specimen in a patient found to have high-grade dysplasia during endoscopic surveillance. Salmon-colored Barrett's mucosa has replaced the squamous mucosa circumferentially. Scattered erosions are visible (arrows).

From: Lewin KJ, Appelman HD. Tumors of the esophagus and stomach. Atlas of tumor pathology (electronic fascicle), Third series, fascicle 18, 1996, Washington, DC. Armed Forces Institute of Pathology.

Graphic 75133 Version 3.0

Anatomic landmarks for the diagnosis of Barrett's esophagus

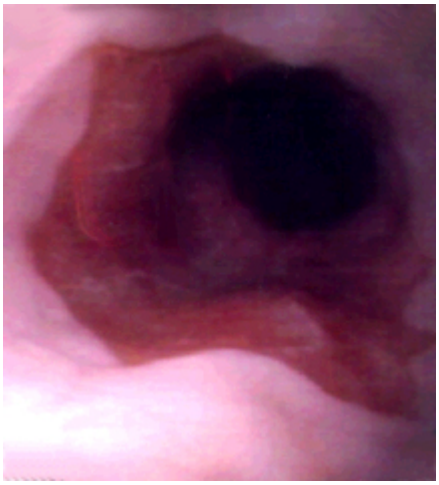


The squamocolumnar junction (SCJ or Z-line) is the visible line formed by the juxtaposition of squamous and columnar epithelia. The gastroesophageal junction (GEJ) is the imaginary line at which the esophagus ends and the stomach begins. The GEJ corresponds to the most proximal extent of the gastric folds. When the SCJ is located proximal to the GEJ, there is a columnar-lined segment of esophagus.

Modified from: Spechler SJ. The role of gastric carditis in metaplasia and neoplasia at the gastroesophageal junction. Gastroenterology 1999; 117:218.

Graphic 76055 Version 8.0

Barrett's esophagus: Endoscopic appearance



Endoscopy shows long segments of columnar epithelium extending well above the esophagogastric junction. This is the characteristic endoscopic appearance of Barrett's esophagus.

Courtesy of Stuart J Spechler, MD.

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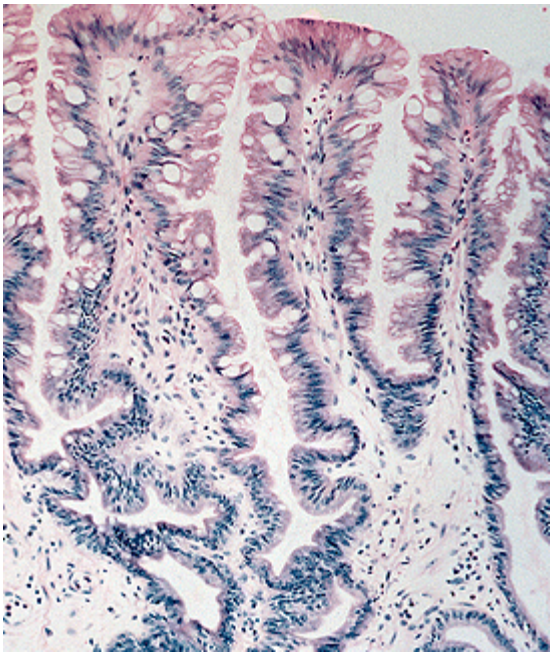
Barrett's esophagus



Biopsy specimen of a patient with Barrett's esophagus shows intestinalized columnar epithelium with goblet cells.

From: Lewin KJ, Appelman HD. Tumors of the esophagus and stomach. Atlas of tumor pathology (electronic fascicle), Third series, fascicle 18, 1996, Washington, DC. Armed Forces Institute of Pathology.

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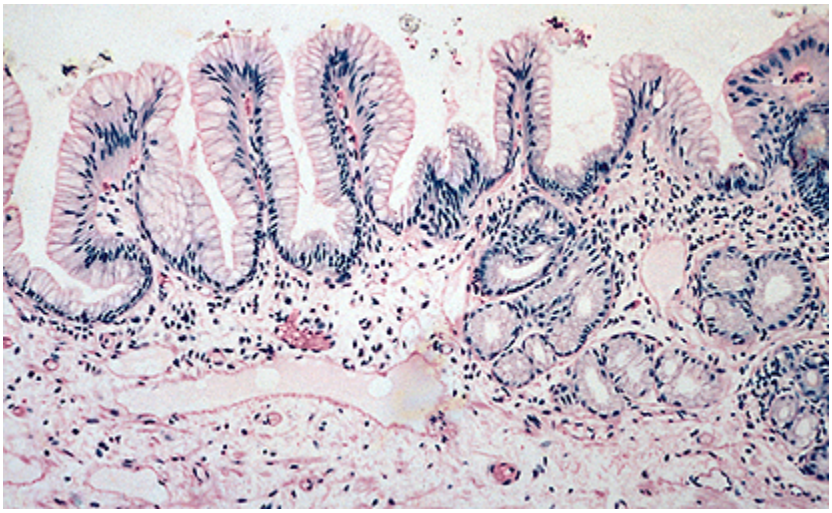
Barrett's esophagus



Low power view of a biopsy specimen from a patient with Barrett's esophagus shows predominantly columnar-lined surface epithelium. Gastric-type pits, mucous glands, and occasional intestinalized crypts are also visible.

From: Lewin KJ, Appelman HD. Tumors of the esophagus and stomach. Atlas of tumor pathology (electronic fascicle), Third series, fascicle 18, 1996, Washington, DC. Armed Forces Institute of Pathology.

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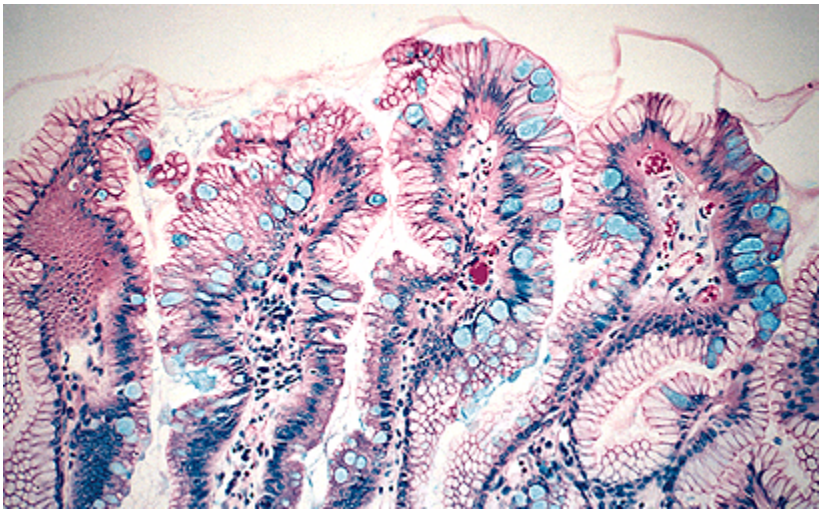
Barrett's esophagus

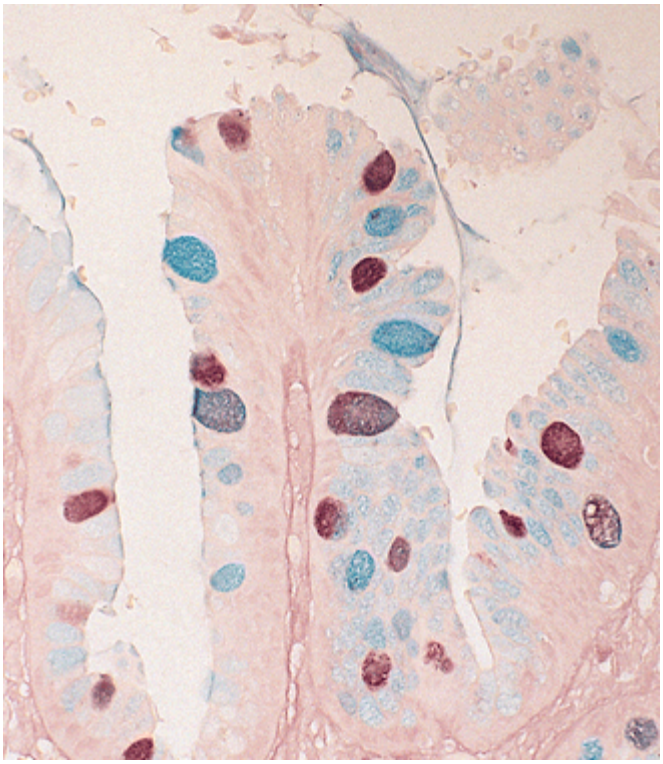


Low power view of a biopsy specimen from a patient with Barrett's esophagus has been stained with Alcian blue, which demonstrates the abundant goblet cells.

From: Lewin KJ, Appelman HD. Tumors of the esophagus and stomach. Atlas of tumor pathology (electronic fascicle), Third series, fascicle 18, 1996, Washington, DC. Armed Forces Institute of Pathology.

Graphic 68357 Version 3.0

Barrett's esophagus



High power view of a biopsy specimen from a patient with Barrett's esophagus has been stained with diamine. This stain demonstrates goblet cells containing sulfated mucins (brown) and nonsulfated mucins (blue).

From: Lewin KJ, Appelman HD. Tumors of the esophagus and stomach. Atlas of tumor pathology (electronic fascicle), Third series, fascicle 18, 1996, Washington, DC. Armed Forces Institute of Pathology.

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Contributor Disclosures

Stuart J Spechler, MD Consultant/Advisory Boards: Castle Biosciences [Barrett's esophagus]; Interpace Diagnostics [Barrett's esophagus]; Ironwood Pharmaceuticals [GERD]; ISOThrive, LLC [GERD]; Phathom Pharmaceuticals [GERD]; Takeda Pharmaceuticals [GERD]. All of the relevant financial relationships listed have been mitigated. **Nicholas J Talley, MD, PhD** Patent Holder: Australian Provisional Patent [Diagnostic marker for functional gastrointestinal disorders]; Biomarkers of irritable bowel syndrome [Irritable bowel syndrome]; Mayo Clinic [Dysphagia questionnaire]; Mayo Clinic [Bowel Disease questionnaire]; Nepean Dyspepsia Index [Dyspepsia]; Nestec [Irritable bowel syndrome]; Singapore Provisional Patent [BDNF Tissue Repair Pathway]. Grant/Research/Clinical Trial Support: Alimetry [Gastric mapping device research collaboration]; Allakos [Gastric eosinophilic disease]; AstraZeneca [Eosinophilic gastritis, eosinophilic gastroenteritis]; Intrinsic Medicine [Bowel syndrome with constipation]; NHMRC Centre for Research Excellence in Digestive Health [NHMRC Investigator grant]. Consultant/Advisory Boards: Adelphi Values [Functional dyspepsia]; Allakos [Gastric eosinophilic disease, AK002]; AstraZeneca [Eosinophilic gastritis, eosinophilic gastroenteritis]; AusEE [Eosinophilic gut diseases]; Bayer [Inflammatory bowel syndrome]; BluMaiden [Microbiome Ad Board]; Comvita Mānuka Honey [Digestive health]; Dr Falk Pharma [Eosinophilia]; GlaxoSmithKline Australia [Educational speaker eosinophilic gut disease]; Glutagen [Celiac disease]; International Foundation for Functional Gastrointestinal Disorders [Advisory board, functional GI disorders]; Intrinsic Medicine [Human milk oligosaccharide]; IsoThrive [Esophageal microbiome]; Planet Innovation [Gas capsule, inflammatory bowel syndrome]; Progenity Inc [Intestinal capsule]; Rose Pharma [IBS]; Viscera Labs [Inflammatory bowel syndrome, diarrhea]. Other Financial Interest: Elsevier textbook royalties [Medical education]. All of the relevant financial relationships listed have been mitigated. **Shilpa Grover, MD, MPH, AGAF** No relevant financial relationship(s) with ineligible companies to disclose.

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