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Treating Barrett esophagus with radiofrequency ablation

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BARRETT ESOPHAGUS is a complication of chronic gastroesophageal reflux disease (GERD). Estimates of the prevalence of Barrett esophagus range widely from 0.4% to more than 20% of the general adult population, depending on the definitions used and the populations examined; experts aren't certain how common Barrett esophagus is worldwide.[1,2] In the United States, applying general prevalence estimates would result in approximately 3.3 million individuals with Barrett esophagus.[3]

About 10% of patients with chronic reflux have Barrett esophagus.[4,5] Why some patients with GERD develop Barrett esophagus while others don't is unclear.[6]

Barrett esophagus is associated with an increased risk of esophageal adenocarcinoma.[7,8] (See *Gauging the cancer risk*.) The incidence of this once rare cancer has increased by more than 500% since the 1970s. The cancer remains highly lethal, with a 5-year survival rate of less than 15%.[9,10]

Radiofrequency ablation (RFA), a minimally invasive procedure for treating Barrett esophagus, is gaining traction with gastrointestinal (GI) specialists. This article will define Barrett esophagus, discuss RFA and other treatment options, and present nursing care for patients being treated for this disorder.

Pathophysiology

Barrett esophagus is a premalignant condition in which the metaplastic columnar epithelium that predisposes a patient to development of cancer replaces the stratified squamous epithelium that normally lines the distal esophagus.[4,7,11] Barrett esophagus stems from *metaplasia*: a process by which one completely differentiated cell type takes the place of another.[4]

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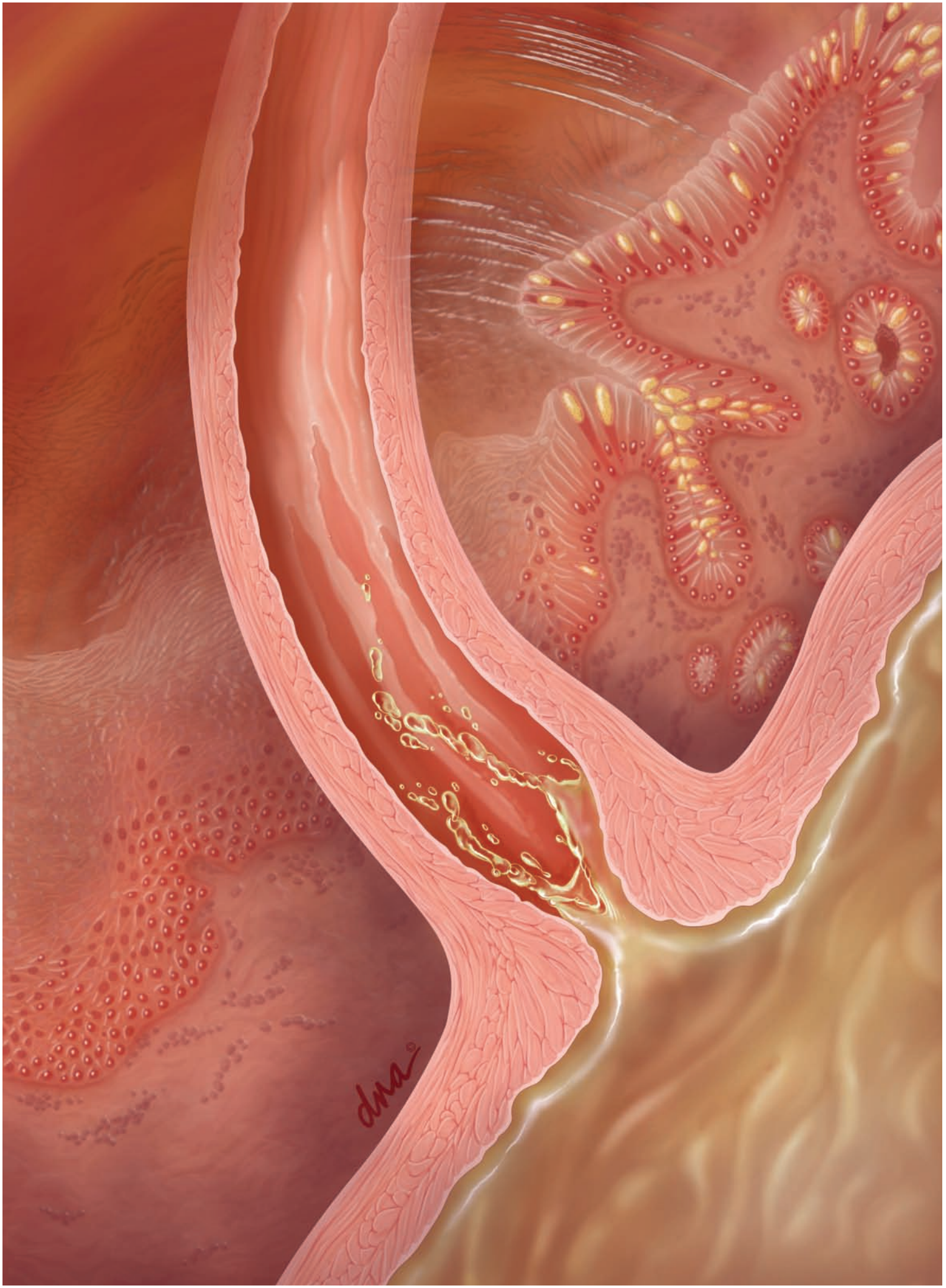


The trajectory of Barrett esophagus can follow this course: nondysplastic Barrett epithelium, low-grade dysplasia, high-grade dysplasia, and adenocarcinoma.[7] Patients may first be diagnosed at any of these stages.

The pathogenesis of Barrett esophagus is believed to begin with gastroesophageal reflux of acid and bile, which injures esophageal squamous cells. Metaplasia may develop as a response to chronic inflammation. In GERD with chronic reflux esophagitis, impaired esophageal squamous cells are replaced with columnar cells.[2] (See *Normal anatomy and pathophysiology of Barrett esophagus*.)

Clinical features and diagnosis

Barrett esophagus is often discovered in middle-aged and older adults during endoscopic exams. The mean age at diagnosis is 55.[2,12,13]

Barrett esophagus is suspected when an upper endoscopy reveals columnar mucosa in the esophagus. Biopsy specimens can then be taken to confirm the diagnosis.[4]

Barrett esophagus may be further delineated as short-segment (<3 cm) or long-segment (≥3 cm), depending on the distance between the gastroesophageal junction and the most proximal extent of the Barrett metaplasia.[4,13] The risk of adenocarcinoma differs with the length of the esophagus lined by Barrett metaplasia, with patients with long-segment Barrett at higher risk of malignancy.[4]

At present, diagnostic criteria mandate that upper endoscopy is required to diagnose Barrett esophagus.[2] Documentation by the endoscopist must include that columnar epithelium lines the distal esophagus. Furthermore, a histologic exam of biopsy specimens from the columnar epithelium must support evidence of intestinal metaplasia.[2]

Recently, one of the most debatable issues in the diagnostic criteria for Barrett esophagus is the goblet cell, which usually resides in the intestines. Once thought to primarily secrete mucus, it's now suggested that goblet cells play a role in maintaining immune tolerance to commensal bacteria and food. Regardless of their function, goblet cells possess specific morphologic characteristics that render them easily identifiable in biopsy specimens. Hence, the goblet cell is a marker for intestinal metaplasia when identified in specimens from the stomach or esophagus.[14]

Most patients diagnosed with Barrett esophagus don't develop esophageal cancer: The possibility of progression to adenocarcinoma of the esophagus is only 0.5% per year in patients without dysplasia on initial surveillance biopsies. If the condition progresses to adenocarcinoma, the risk of lymph node metastasis is 1% to 2% when adenocarcinoma is limited to the esophageal mucosa.[15]

Regardless of the stage of disease at diagnosis, patients require lifelong surveillance, including screening with esophageal biopsies at regular set intervals. Recommendations depend on the presence of dysplasia in these specimens.[13]

Endoscopic ablative therapies

Endoscopic ablative therapies use thermal, photochemical, or radiofrequency energy to ablate the abnormal epithelium in Barrett esophagus. The most commonly used modality is RFA. However, noncontact methods (such as photodynamic therapy or cryoablation) occasionally may be needed in patients with tortuous esophagus or strictures.[13]

Typically performed on an outpatient basis, RFA is an FDA-approved, minimally invasive procedure used to ablate or remove the superficial layer of the esophagus at the site where the metaplastic columnar tissues of Barrett esophagus reside. RFA is usually recommended for high-grade dysplasia and may be considered to treat low-grade dysplasia as well.[14] Local coagulation necrosis is generated by an electric circuit and by directing varying radiofrequency currents to the selected tissues.[16]

Studies have supported the efficacy, durability, and safety of RFA in treating Barrett esophagus.[11] For example, evidence extrapolated from the Ablation of Intestinal Metaplasia Containing Dysplasia (AIM) trial revealed that RFA removed low-grade dysplasia in 90% of patients and high-grade dysplasia in 81% of patients.[6,17] Similarly, researchers from the Academic Medical Center in Amsterdam reported positive results of a randomized controlled trial that led to early termination of the study.[6]

In endoscopic mucosal resection, the abnormal Barrett tissue is first lifted by injection of a fluid, such as 0.9% sodium chloride solution or dilute epinephrine, into submucosal tissue and then removed by suction via endoscope. In the case of mucosal abnormalities such as nodularity (raised areas of tissue adjacent to or within the Barrett esophagus), endo-

Gauging the cancer risk

Presently, esophageal cancer is the eighth most common cancer worldwide and it's considered to be aggressive with a poor survival rate. It currently affects more than 450,000 people globally.[3,4,25] In comparison to other cancers, esophageal cancer is relatively rare. In the United States, it's reported as the 11th leading cause of cancer death.[10]

Most esophageal cancers are squamous cell or adenocarcinomas. Barrett esophagus can be a precursor of esophageal adenocarcinoma and it shares many of the same risk factors.[4] Although the incidence of esophageal squamous cell carcinoma is declining in the United States, the incidence of adenocarcinoma emerging from Barrett esophagus has increased considerably since the 1970s.[10,25]

scopic mucosal resection of these abnormalities should be performed prior to RFA.[18]

In a small group of patients with high-grade dysplasia (less than 2%), there is the possibility of cancer in the lymph nodes close to or adjoining the esophagus, which RFA can't cure.[19] The only effective therapy is esophagectomy, which removes the neoplastic epithelium as well as any regional lymph nodes and occult malignancy.[13]

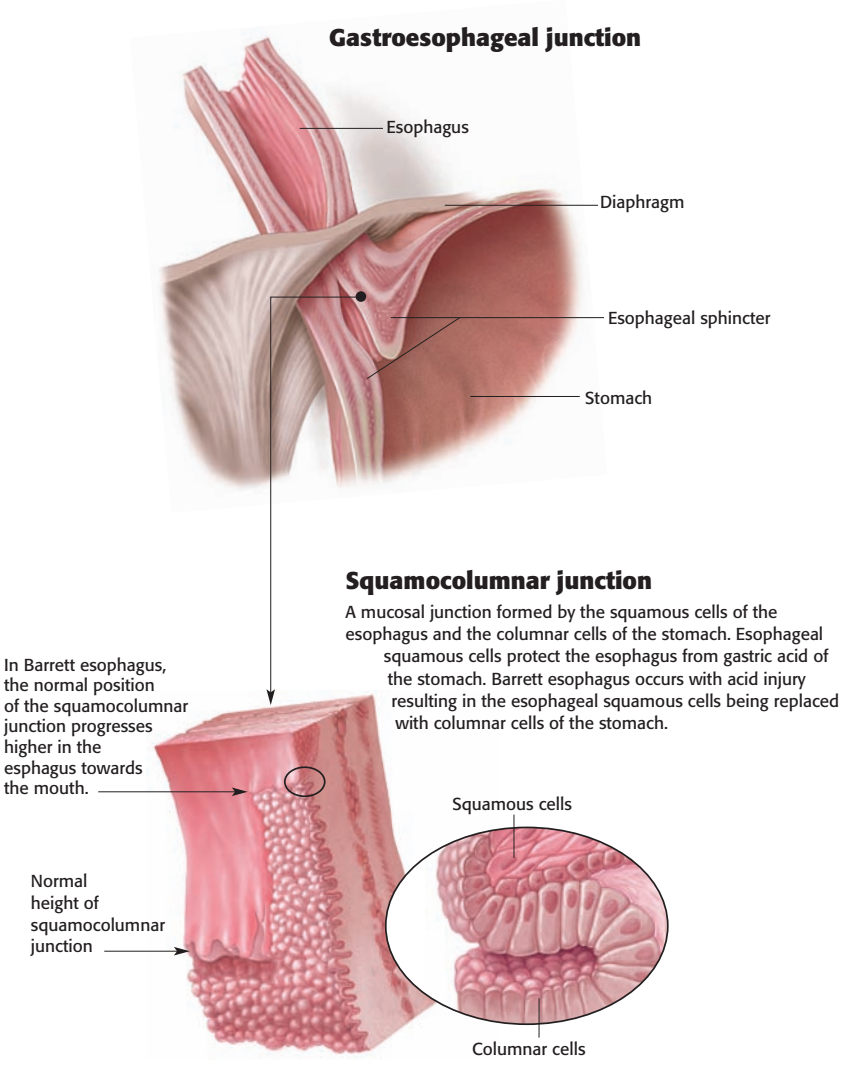
High-grade dysplasia in Barrett esophagus is associated with a 6% annual risk of esophageal cancer, so intervention is justified in these patients.[4] Endoscopic eradication therapy consisting of a combination of endoscopic resection and ablative modalities is now recommended by the American Gastroenterological Association and American Society for Gastrointestinal Endoscopy for patients with confirmed high-grade dysplasia as opposed to mere surveillance.[4]

RFA is a first-line treatment choice for patients with high-grade dysplasia after mucosal abnormalities have been removed by endoscopic mucosal resection, as well as for patients with early cancer postresection.[6] Endoscopic eradication therapy with RFA is especially beneficial for patients with high-grade dysplasia to reduce the risk of progression to cancer.[4] Studies are underway to analyze the predictors of response to ablative techniques and to determine the optimal interval for surveillance after the application of ablative techniques.[6]

Nursing implications

RFA is usually performed on an outpatient basis with the patient under moderate sedation/analgesia. Nurses need to be knowledgeable about RFA to educate patients and families, optimize patient outcomes, and maintain a safe and comfortable environment for patients. Nursing considerations encompass pre-, intra-, and postprocedural care.

Normal anatomy and pathophysiology of Barrett esophagus



Source: Anatomical Chart Company

• **Preprocedure**. A multidisciplinary team including gastroenterologists, nurses, pathologists, surgeons, and anesthesiologists work together to optimize patient outcomes. The specific goals of treatment and possible outcomes should be discussed before the procedure with patients and families as part of the informed consent process.[16]

Patient education is an integral part of the RFA procedure. Nurses often provide the preprocedure education at the healthcare facility. A comprehensive assessment includes inquiries about disorders such as arthritis, back pain, headaches, and other conditions commonly treated with nonsteroidal anti-inflammatory drugs (NSAIDs), which are contraindicated for 7 days following the procedure.

Informed consent includes advising the patient about potential complications such as perforation, bleeding, and aspiration; also mentioned should be the potential for esophageal stricture, recurrence of Barrett esophagus, and the fact that RFA

may decrease but not eliminate the risk of cancer in the future. Additional materials, such as links to useful websites and printed handouts, can help lessen a patient's anxiety and correct misconceptions about RFA. Patients should be advised to arrange for a companion to take them home after the procedure.

Lab work will be ordered before RFA, including a complete blood cell count and coagulation profile.[5,16] Abnormal values should be reported to the healthcare provider. Patients on any antiplatelet or anticoagulation therapy such as aspirin, clopidogrel, heparin and its analogs, warfarin, and direct oral anticoagulants, such as dabigatran, should be carefully assessed for bleeding risks. Contraindications for the procedure include uncorrectable coagulopathy and uncontrolled infections.[16]

Patients on antiplatelet or anticoagulation therapies should be assessed on an individual basis to determine if medications will be held before the procedure. The timing for discontinuing anticoagulants is individualized depending on the medication and the specific disorder requiring anticoagulation. Scheduling of interruption and reinstitution of anticoagulation is determined by the treating gastroenterologist in consultation with cardiology.

Anesthesia and sedation/analgesia guidelines are agency-specific. Nurses should check N.P.O. status and ascertain the time of last liquids consumed. Some practices may allow clear liquids up to 2 hours before the procedure while others have patients fast after midnight.[5,16]

Venous access should be established and the nurse should anticipate giving I.V. fluids and medication as prescribed. Common medications used for the procedure include I.V. midazolam (a benzodiazepine) and I.V. fentanyl (an opioid).[5] Typically administered by an anesthesiologist or nurse anesthetist, propofol is often used for sedation. Glycopyrrolate, a long-acting anticholinergic, is often administered to reduce secretions.

Oral secretions may be copious during the procedure, so patients will require frequent suctioning to prevent aspiration. Supplemental oxygen and suction equipment should be set up and available for immediate use. Staff should be prepared to maintain continuous monitoring of heart rate, BP, respiratory rate, and oxygen saturation, which should be documented at least every 5 minutes. Capnography can be used to quickly detect adverse reactions associated with procedural sedation.[20]

• **Intraprocedure.** During RFA, patients will be placed in the left lateral decubitus position. As for other upper GI procedures, nurses are responsible for supporting anesthesia with airway management and monitoring of sedation/analgesia.

At the initial and any subsequent ablative procedure, the nurse records the measurement of the top of visualized Barrett tissue as measured from the patient's incisor teeth, as well as the location of the esophagogastric junction, defined by the top of the gastric folds. The endoscopist relays these measurements to the nurse during the initial portion of the procedure. This information is recorded and retained in the endoscopy unit and in the patient's medical record for future reference, because multiple treatments are often necessary to ablate all the diseased tissue and the patient may need treatment from more than one center.

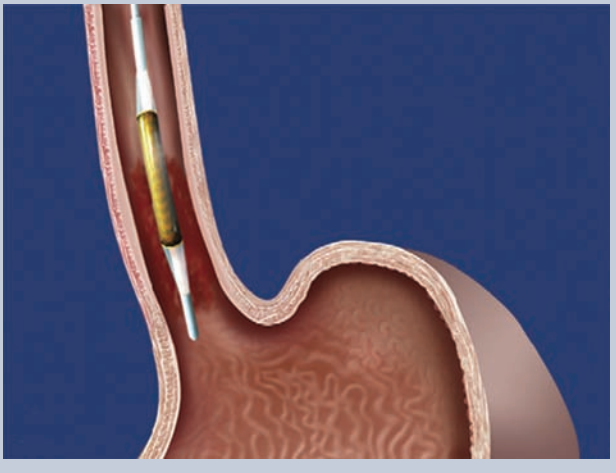
Because the circumference of the esophagus is variable from patient to patient and isn't uniform throughout its length, a sizing procedure is undertaken following visualization and measurement of the Barrett tissue. A sizing catheter and balloon device is passed into the patient's esophagus and then attached to the energy generator. The sizing balloon is passed millimeter by millimeter into the esophagus and inflated at each millimeter. The energy generator measures the circumference of the esophagus at each millimeter and a recommended balloon size at each millimeter.[21]

Recording data obtained during the sizing phase is an important nursing function. Based on these data, the interventionist chooses the proper balloon size to perform the ablation.[21]

After this step, the endoscope is reintroduced and the Barrett tissue is

RFA of Barrett esophagus

Insertion of ablation probe over guidewire.



Source: Kaiser L, Kron IL, Spray TL, eds. *Mastery of Cardiothoracic Surgery*. 3rd ed. Philadelphia, PA: Wolters Kluwer Health/Lippincott Williams & Wilkins; 2013.

irrigated with N-acetylcysteine to reduce the amount of mucus coating the esophagus. The ablation catheter is then introduced in a side-by-side fashion next to the endoscope in the esophagus. Ablation is repeated until all the Barrett tissue has been treated.[21]

In subsequent treatments, the sizing step is repeated only if the patient still has circumferential Barrett epithelium remaining. If only patchy disease remains, a focal through-the-scope ablation catheter is used to "touch up" remaining Barrett tissue missed by the initial ablation because the esophagus isn't a perfect cylinder. Meticulous record keeping is essential: Balloon size, total amount of centimeters ablated, machine settings, and energy dose (joules) must all be accurately documented.[21]

The manufacturer of the circumferential balloon has introduced an updated device that entirely eliminates the requirement for the sizing process. On the new device, the radiofrequency electrode surrounds the sizing balloon. The balloon inflates to a preprogrammed optimal pressure and then the energy is applied via the generator. This newer device requires a software upgrade to the generator. Not all centers have yet upgraded the software as this requires an additional investment. However, universal adoption of this newer balloon-RFA catheter is expected.[22]

• **Postprocedure.** Adverse events associated with RFA include esophageal strictures, upper GI hemorrhage, and chest pain, but it's generally considered a low-risk procedure.[18] The nurse should monitor vital signs, assess for signs and symptoms of bleeding, maintain hydration via I.V. fluids for 30 to 60 minutes, and perform a pain assessment.

Postprocedure pain medications are generally not required. If the nurse feels that pain medication might be indicated, the endoscopist must evaluate the patient before any drug is administered. Patients may be given a mouthwash solution consisting of viscous lidocaine, aluminum hydroxide, and diphenhydramine to ease throat pain.[5]

Patients can expect to remain in the postanesthesia care unit for about 1 hour.

Discharge instructions

Patients and significant others should receive specific instructions on aftercare. For example, patients and families or caregivers should be instructed to contact their healthcare provider immediately to report chest pain, severe difficulty in swallowing, abdominal pain, fever, bleeding, difficulty breathing, or vomiting.[23] Inform patients that some pain or difficulty swallowing is to be expected during recovery.

Educate patients about their prescribed medications, which include:

• oral liquid acetaminophen with or without codeine, hydrocodone, or oxycodone for 7 days as needed.

• sucralfate oral suspension four times a day for 1 to 2 weeks. Sucralfate adheres to esophageal tissue injured by ablation, protecting it from acid reflux as it heals.[18]

• a protein pump inhibitor (PPI) such as omeprazole or esomeprazole, to facilitate healing of the injured mucosa so it can regenerate squamous epithelium. Patients typically will take a PPI twice a day for 8 weeks, then once a day as maintenance therapy.[18] Instruct patients to take the PPI before eating and complete the full course of treatment, even if symptoms are relieved.[10,11]

Patients may experience a low-grade fever in the first few days after the procedure. Instruct them to monitor their temperature three times a day and report a fever of greater than 100.9º F (38.3º C).[16]

Patients are usually instructed not to take any NSAID, including aspirin, for 7 days. Generally, other anticoagulants are held until the morning following the procedure.

The resumption of postprocedure diet is usually determined by the interventionist. Typically patients are instructed to consume only cold or room temperature liquids, not hot and never carbonated, for 24 hours, then gradually advance to a soft diet, as tolerated, for 1 week, and then progress to a normal diet.[18]

Most patients can resume their normal level of activities within 24 hours. Warn them not to drive a car or engage in other activities requiring alertness for 24 hours post procedure. As directed, they should return for a follow-up appointment within 1 week postprocedure.

Ongoing care

Patients with Barrett esophagus require lifelong surveillance and treatment.[23,24] Nurses caring for these patients should provide support and educate the patients about managing their disease.[9,10] This includes instructing patients on the importance of regular endoscopic screenings and follow-ups as directed by the interventionist and healthcare provider, based on the initial grade of dysplasia.[18] Nutrition and lifestyle management, including smoking cessation and weight management, are also essential components of the teaching plan.[12]

To minimize the chance of reflux, patients should be taught to eat smaller meals on a more frequent basis to prevent gastric distension, and to avoid acidic foods and beverages, such as citrus fruits, tomato products, coffee, and spicy foods, because these foods and beverages can irritate the esophageal mucosa. Fatty foods, alcohol, peppermint, and chocolate should also be avoided because they can relax the lower esophageal sphincter or delay gastric emptying.[12,23]

Teach patients to maintain an upright position for 2 to 3 hours after eating and to sleep with the head of the bed elevated 6 to 10 in (15.2 to 25.4 cm).[12] If the patient seeks care for a digestive issue from any other

healthcare provider during the 6 months following RFA, he or she should inform the provider of this procedure because the esophagus is still healing and care must be taken to avoid injury.

Finally, regularly perform medication reconciliation and reinforce the importance of adhering to the prescribed regimen.

Management lasts a lifetime

Because Barrett esophagus is a lifelong disorder, patients require timely treatment and ongoing management. Nurses caring for these patients must translate evidence into practice to improve patient safety and optimize outcomes. For more information, visit www.cc.nih.gov/drd/rfa. ■

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