Radiofrequency Ablation in Barrett's Esophagus

Vani J.A. Konda, Uzma D. Siddiqui, Irving Waxman*

Center for Endoscopic Research and Therapeutics (CERT), University of Chicago, 5758 S. Maryland Avenue, MC 9028 Chicago, IL, USA

Received 28 October 2012; received in revised form 31 January 2013; accepted 19 March 2013

KEYWORDS
Barrett's esophagus; Radiofrequency ablation; Video

Abstract
Radiofrequency ablation (RFA) is an endoscopic modality used in the treatment of Barrett's esophagus. RFA may be performed using a balloon-based catheter or using one of the probe catheters that attaches to the distal end of the endoscope. Here we demonstrate step-by-step instruction in using radiofrequency ablation in the treatment of Barrett's esophagus and highlight key concepts in the technique.

© 2014 The Authors. Published by Elsevier GmbH. Open access under CC BY-NC-ND license.

1. Background

- Barrett's esophagus (BE) is a risk factor for esophageal cancer. Endoscopic therapy has become the mainstay of treatment for high-grade dysplasia and intramucosal carcinoma in the setting of BE. Radiofrequency ablation (RFA) has emerged as a widely utilized method of ablation.
- RFA applies direct thermal energy to the esophageal mucosa using electrodes embedded in a circumferential balloon or a probe catheter. The HALO Flex generator system is used with a variety of ablation catheters: HALO 360; HALO 90; HALO 90 Ultra; and HALO 60.
- Any visible or raised lesion in the setting of BE with dysplasia should be addressed with endoscopic mucosal resection (EMR) in order to provide an accurate histological diagnosis and staging, as well as eradicate the lesion.
RFA may be used to treat either the remainder of the Barrett’s esophagus after focal EMR in a hybrid approach of therapy or to ablate flat Barrett’s esophagus as the primary modality.

2. Materials
- Endoscope.
- Halo Flex Generator.
- An ablation catheter.
  - Halo 360.\(^1\)
  - Halo 90.
  - Halo 90 Ultra.
  - Halo 60.
- 0.45 μm filter.
- N-acetylcysteine.

3. Endoscopic procedure
- RFA of Barrett’s esophagus using the HALO 360 probe catheter.
- RFA of Barrett’s esophagus using the HALO 90 probe catheter.
- Introduction of the other ablation probes available including HALO 90 Ultra and HALO 60 probe catheters.

4. Discussion
Successful complete eradication of Barrett’s esophagus and associated neoplasia has been demonstrated with an initial endoscopic mucosal resection for visible abnormalities as needed, followed by circumferential application, and then followed by serial focal application [1].

In a randomized, sham-controlled trial, patients with high-grade dysplasia (HGD) demonstrated complete eradication in 81.0% of cases treated with RFA compared to 19.0% in the sham-control group. Disease progression was lower in the ablation group (3.6% vs. 16.3%) and fewer cancers were noted (1.2% vs. 9.3%) [2]. Durability data was also published demonstrating 98% eradication of dysplasia and 91% eradication of metaplasia at 3 years [3].

A randomized control trial examined patient with HGD or early cancer in BE that was less than 5 cm in length. Patients were randomized to two groups: stepwise radical endoscopic resection (SRER) where focal EMR is followed by serial EMR or EMR/RFA where focal EMR is followed by RFA [4]. The SRER arm had complete remission at 100% and the EMR/RFA group had complete remission at 96%. The SRER group had a significantly higher rate of stenosis compared to the EMR/RFA group. This study demonstrated that RFA can successfully eradicate remaining BE after focal EMR of visible lesions with a low rate of complications.

The efficacy and safety of RFA has also been demonstrated in patients with BE without dysplasia. The AIM II trial reported 98% complete remission of IM after stepwise circumferential therapy with additional focal ablative therapy of remaining BE with a 2.5 year follow up [5]. Five-year data demonstrates complete remission of intestinal metaplasia in 92% [6]. Select patients with non-dysplastic Barrett’s esophagus may benefit from RFA; however, published guidelines have not clarified how best to stratify these patients.

While the rate of buried glands is reportedly low after RFA, further work is needed to optimize biopsy protocol and understand the biological potential of buried metaplasia [7]. Cases of squamous neoplasia after endoscopic therapy with RFA underscore that surveillance after RFA is still necessary [8,9].

5. Tips and tricks
- N-acetylcysteine may be sprayed onto the Barrett’s segment to clear the ablation surface.
- The Halo 360 Balloon may be used to treat long segment, circumferential Barrett’s esophagus. Prior to treatment, a sizing balloon is used to select the recommended size of the Halo 360 balloon.
- A firm grip over the balloon catheter and endoscope should be used to prevent balloon migration during inflation.
- The Halo 90, Halo 90 Ultra, and Halo 60 probe catheters may be used to treat areas of Barrett’s esophagus in a focal manner. The probe catheter is attached to the distal end of the scope and is positioned between 10 o’clock and 2 o’clock. The specific probe catheter may be selected based on the desired footprint of treatment and need for maneuverability.
- When using one of the probe catheters circumferentially at the gastroesophageal junction, torque the scope to move the probe clockwise to a position adjacent to the previously treated area rather than pulling scope back and advancing scope to reposition.
- The recommended sequence for treatment with the Halo 360 and Halo 90 Ultra is to ablate the segment with one application of energy per area, and then repeat ablation to the segment for another application.
- The recommended sequence for treatment with the Halo 90 and Halo 60 is to ablate the segment with two applications per area, scrape the mucosal surface and clean the electrode, and then repeat ablation to the segment with an additional applications of energy per area.

6. Scripted voiceover

Barrett’s esophagus is a risk factor for esophageal cancer.
Endoscopic therapy has become the mainstay of treatment

\(^1\)Additional materials for use with Halo 360.
Radiofrequency Ablation

Voiceover Text

As demonstrated, the sizing catheter is attached to theObtain measurements in 1cm increments down the entirePosition the sizing balloon 12cm above the gastroesophagealJunction. The HALO generator system delivers radiofrequency energy to the esophageal mucosa in a uniform manner to a depth of approximately 800 microns. This procedure uses theendoscope, the generator and an ablation catheters. The Halo 360, is an inflatable 4 cm balloon with electrodes that span 3cm. The Halo 90. a distal attachment, measures 20x13mm. Compared to the Halo 90, the Halo 90 Ultra has twice the length and the Halo 60 has 60% of the surface area. Careful inspection with high definition of the Barrett’ssegment should be performed. Document the top of the gastric folds and intestinalmetaplasia. Narrow band imaging may also identify lesions. Any visiblelesions should be resected. Spray N-acetylcysteine to clear the surface. The Halo360 is suited for long segments. Several pieces of equipment are needed. This animation demonstrates the sizing. Place a guidewire into the stomach and withdraw the endoscope. Position the sizing balloon 12cm above the gastroesophagealjunction. Obtain measurements in 1cm increments down the entireesophagus. As demonstrated, the sizing catheter is attached to the generator with an intervening filter. With the plastic sheath over the balloon, the balloon is calibrated. Over the guidewire, the balloon is positioned 12cm above the gastroesophageal junction. Measurements are obtained by inflating the balloon with aninflation foot pedal. Advance the balloon by 1 cm and re-inflate and repeat through the esophagus. A size per measurement is recommended. Use the smallest recommended size for ablation. A sudden increase of size may indicate that the balloon has entered the stomach. Withdraw catheter and leave the guidewire. This animation shows the HALO360 catheter, over theguidewire, administering the first application underendoscopic guidance. Then probe and endoscope are withdrawn. A cap is then used to remove coagulum from the treated area. With guidewire re-positioned, a second application with theballoon is performed under endoscopic guidance. As demonstrated, the balloon catheter is advanced over thewire. Pass the endoscope alongside the catheter. Connect the catheter to generator and filter. The electrodes are positioned at the top of the Barrett’s. Inflate the balloon and administer ablation with foot pedals.Suctioning will help oppose the mucosa and electrodes. Firmly grip both catheter and endoscope to avoid balloonmigration. The balloon and endoscope are then advancedapproximately 3 cm. Allow a small overlap between theelectrodes and the treated area.

Voiceover Text

Inflate the balloon and apply treatment. Repeat as needed. Disconnect the catheter from generator during insertion orremoval. Withdraw the deflated balloon and endoscope. Place a soft cap on the endoscope to scrape off the ablatedcoagulum. Replace guidewire and withdraw endoscope. Clean balloon with water along the grooves. Reinsert the catheter and pass scope along the catheter. Perform another treatment. Target any areas missed with thefirst treatment. The entire segment receives one application, cleaning, and one more application with the Halo360. Use the HALO90 catheter for focal or residual areas, shortsegments, or areas in difficult anatomy where the balloon apposition may be suboptimal.

References


