Periesophageal Vagal Nerve Injury Complicating Atrial Fibrillation Ablation

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Percutaneous catheter ablation is being widely used in the treatment of patients with symptomatic and drug-resistant atrial fibrillation (AF). Although AF ablation is generally considered to be safe, serious complications may occasionally occur. Periesophageal vagal nerve injury caused by extracardiac penetration of ablative energy is rare, but can potentially compromise the clinical outcome to a great extent, necessitating surgical treatment. Therefore, the electrophysiologist must be cognizant of the pathophysiology of this complication.

The periesophageal vagal nerve plexus controls gastric peristalsis, the pyloric sphincter, and gastric motility. The vagal nerve forms a plexus as the periesophageal vagal nerve on the anterior wall of the esophagus, behind the left atrial posterior wall, and between the left and right pulmonary veins. The distance between the anterior esophageal plexus and the posterior left atrial endocardium is 4.1±1.4 mm.

Common symptoms of this complication include nausea, eructation, and abdominal bloating. Gastric hypomotility is considered present when abdominal fluoroscopy, endoscopy, or computed tomography reveal a medium to large amount of food residue even after overnight fasting.

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vomiting, bloating, and abdominal pain, which develop within a few hours to a few days after the ablation procedure. Patients are diagnosed with periesophageal vagal nerve injury if they exhibit these symptoms and if the findings of gastrointestinal fluoroscopy, endoscopy, or computed tomography reveal the presence of a medium to large amount of food residue even after overnight fasting, indicating gastric hypomotility (Figure). Other methods to evaluate gastric motility include scintigraphy using isotope-labeled solid food or real-time magnetic resonance imaging. Although the incidence of gastric hypomotility has been reported to be only 0.3%, it is difficult to diagnose and completely assess this disorder because some symptoms are vague and difficult to grade by severity. Therefore, its incidence may be higher than reported.

In this issue of the Journal, Lo et al describe a new and simple approach to evaluating gastric motility after the AF ablation. Gastric movement can be assessed by gastric electrical activity, which is composed of slow gastric waves and spiked potentials. The slow waves are normally of 3 cycles/min in humans and can be measured noninvasively by electrogastrography. Lo et al report that the slow gastric wave activity reduced just after ablation for AF, whereas that in control patients undergoing catheter ablation for other arrhythmias showed no remarkable post-ablation change. Although the severity of symptoms was not assessed in their study, 30% of the patients undergoing AF ablation had postprandial abdominal fullness, bloating, or swelling. Their findings suggest that the incidence of periesophageal vagal nerve injury may be higher than expected, and physicians must be alert enough to recognize this disorder during and after AF ablation.

Lo et al. show that the diminished slow-wave cycle of the stomach improved 3 months after catheter ablation, which is consistent with a previous report indicating that most patients with this complication recover within a few months of catheter ablation. However, some patients have severe gastrointestinal symptoms persisting for 1 year, resulting in considerable weight reduction or pyloric spasm, which necessitates surgery.

The management of this complication is essentially conservative. The patient should be instructed to fast for 2–14 days, and then small, low-fat, and low-fiber meals should be gradually introduced. Intravenous erythromycin may be effective in restarting gastric movement during acute episodes of gastric stasis, when oral intake is not tolerated. Erythromycin mimics the effect of the gastrointestinal polypeptide, motilin, on gastrointestinal motility, probably by binding to motilin receptors and acting as a motilin agonist. Janssens et al reported that the intravenous administration of 200 mg of erythromycin normalized the prolonged gastric emptying times for both solids and liquids in patients with diabetic gastroparesis.

Oral mosapride or metoclopramide is also effective in alleviating the symptoms in some patients after they are able to eat. Mosapride stimulates 5-hydroxytryptamine receptors, resulting in the release of acetylcholine from the neurons in the myenteric plexus. It stimulates antral and duodenal motility and may improve antroduodenal coordination. A bolus injection administered to the pyloric sphincter has been reported to improve the delayed gastric emptying in patients with gastroparesis after AF ablation; however, a controlled study revealed that in patients with gastroparesis, the improvement in gastric emptying brought about by this treatment did not differ significantly from that afforded by placebo.

Although there is no established approach for avoiding injury to the periesophageal vagal nerve, the risks can be minimized by using the same techniques for preventing other esophageal complications, such as atrioesophageal fistula or esophagitis. The approach adopted by the authors was to monitor the esophageal temperature. Delivery of radiofrequency (RF) energy is discontinued when the esophageal temperature reaches 42°C. In a previous large, population-based, retrospective study of 3,695 patients, the group undergoing AF ablation without monitoring of the esophageal temperature had a higher incidence of periesophageal vagal nerve injury (2.5%) than those undergoing ablation with esophageal temperature monitoring (0.2%, P < 0.0007). Furthermore, compared with power limitation alone, esophageal temperature monitoring has been reported to be associated with lower frequency of esophageal injury.

Another approach to preventing esophageal complications is to avoid delivering RF energy to the left atrial posterior wall, which is adjacent to the esophagus, with measures such as box isolation or reducing the RF energy to 25 W on the left atrial posterior wall. However, no consensus has yet been reached on the preventive measure that definitively prevents esophageal complications.

Prospective studies are required to assess the clinical benefits of each of the aforementioned measures for preventing esophageal injury. The electrophysiologist should avoid injury to extracardiac structures during ablation and tailor the ablation strategy such that complications of AF ablation are minimized.

References