

Gastric distension and gastroparesis following pulmonary vein isolation for atrial fibrillation: a case report and review of the literature

S. Nullens, S. Naegels, I. Ruytjens

Department of Gastroenterology and Hepatology, ZNA Middelheim Hospital, Antwerp, Belgium.

Abstract

We present a case of marked gastric distension and gastroparesis in a patient with atrial fibrillation who underwent a pulmonary vein isolation, a procedure commonly performed in patients suffering from atrial fibrillation in order to regain sinus rhythm. Two days following the procedure, the patient presented with marked abdominal distension, and computed tomography imaging was consistent with gastroparesis and/or delayed gastric emptying. A tentative diagnosis of pylorospasm was made. After a first attempt with a conservative approach, gastroscopy with both pyloric dilatation and intra-pyloric botox injection was performed due to persisting discomfort. The symptoms gradually resolved following this intervention.

Gastroparesis and gastrointestinal distension is a rare complication following pulmonary vein isolation, and is mainly thought to result from temporary damaging the vagal nerve. Since a rising number of patients undergo an ablation of the pulmonary veins as treatment for atrial fibrillation, gastroenterologists should become aware of this probably not so rare complication. (*Acta gastroenterol. belg.*, 2022, 85, 531-534).

Keywords: pulmonary vein isolation, gastroparesis, vagal nerve, pylorospasm

Introduction

Pulmonary vein isolation (PVI) was developed in the late '90s as a treatment for patients suffering from atrial fibrillation (AF). By means of an electrophysiological workup, it was shown by the working group of Haïssaguerre that aberrant electrical triggers located in the pulmonary veins are responsible for the onset of atrial fibrillation in a significant number of these patients. Electrical isolation of the pulmonary veins by means of ablating these ectopic triggers can successfully suppress the initiation of atrial fibrillation (1). This can be obtained by radiofrequency ablation (RFA) or by means of a cryoballoon, in which circumferential PVI can more efficiently be achieved in comparison to the point-by-point RFA. In short, cryothermal energy delivered by means of a balloon freezes the adjacent tissue, with less damage to the surrounding tissue architecture when compared to radiofrequent ablation (2). Long term success of PVI is sometimes hampered by the occurrence of electrical reconnection of these aberrant circuits, for which redo procedures are often attempted. A PVI is generally considered to be a safe procedure, with complications numbers ranging somewhere between 0.5% (periprocedural stroke, pulmonary vein stenosis, cardiac tamponade) and 5% (vascular com-

plications and asymptomatic cerebral embolism of unknown significance). Mortality is low (<0.2%). The most commonly feared gastrointestinal complication is esophageal injury or development of an atrio-oesophageal fistula, which should be suspected in patients suffering from chest pain, hematemesis, infection and cerebral complications (stroke, transient ischemic attack) the first week following ablation (3). Phrenic nerve palsy is described in 1-2% of all ablated patients. However, the incidence of other gastrointestinal complaints and complications, as well as that of collateral nerve damage, presumably due to the anatomical proximity of nerve structures that innervate the pyloric sphincter and stomach to the left atrium wall and pulmonary veins, remains poorly investigated (4, 5).

Case history

We present the case of a 69 year old male. Medical history was notable for a latex allergy, paroxysmal atrial fibrillation, mild mitral valve insufficiency and a basocellular carcinoma on the helix of the right ear for which he received surgery as well as brachytherapy. PVI was performed for the first time with a cryoballoon. The left superior and inferior pulmonary vein were ablated with one application (180 s). This procedure was complicated by right phrenic nerve palsy following the cryo-application of the right superior pulmonary vein, resulting in paralysis of the right diaphragm. No immediate recuperation was seen. Clinical evaluation four weeks later showed resolution of the AF with persistent right diaphragm paralysis which was managed conservatively. Eight months later, recurrence of AF was noted, and a PVI with cryoballoon was attempted once again under general anesthesia. 3D mapping of the left atrium displayed a reconnection of the right superior and inferior pulmonary vein, for which a second procedure with isolation of both veins was performed, as well as the ablation of an additional tissue ridge between the left atrial appendage, the left superior vein and the carina. The second

Correspondence to: Sara Nullens, ZNA Middelheim, Department of Gastroenterology and Hepatology, Lindendreef 1, 2020 Antwerp, Belgium.
Email: sارانullens@gmail.com

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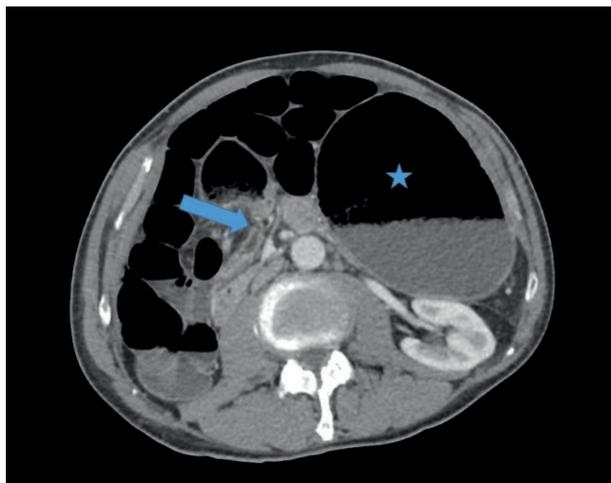


Figure 1. — A transverse plane section of the patient's abdominal computed tomography after presenting himself to the Emergency Room. The asterisk denotes the grossly distended stomach compatible with gastric hypomotility and gastroparesis, whereas the arrow points towards the presumed pylorospasm.

procedure in itself was uneventful. 48 hours following the redo procedure, the patient presented himself to the Emergency Room with complaints of general abdominal discomfort and nausea. Clinical examination showed a grossly distended abdomen with abundant peristalsis, no guarding or rebound tenderness, and presence of belching, flatulence as well as non-bloody diarrhea several times daily. Computed tomography imaging of the abdomen showed a distended stomach consistent with impaired gastroparesis / delayed gastric emptying. Gastroscopy was performed however the antrum and pylorus could not be visualized due to the presence of large pieces of solid food in the stomach, despite aspirating over 300 cc of fluid. The patient was admitted to the Surgical ward and managed conservatively. He was discharged 7 days later. Unfortunately, he presented himself 4 days later once again to the Emergency Room with the same clinical picture. Computed tomography of the abdomen displayed a grossly distended stomach, consistent with delayed gastric emptying, as well as a possible pylorospasm (figure 1). No masses were visualized. A tentative diagnosis of gastric hypomotility and pylorospasm due to vagal nerve injury was made, and gastroscopy was performed 48 hours later under general anesthesia with pyloric dilatation (TTS, 20 mm for 20 s) with subsequent injection of botulinum toxin (100U in total). A central venous line was placed as well as a nasogastric tube. Liquid as well as solid foods were gradually reintroduced in consultation with the patient over the following days. He was successfully discharged 14 days later. We presumed that the pyloric dilation and injection of botulinum both contributed to the patients' clinical improvement, however this remains uncertain.

Discussion

Pulmonary vein isolation is an effective treatment strategy in the management of patients with atrial fibrillation, who have failed or are intolerant to anti-arrhythmic drugs. Well-known gastro-intestinal complications are the development of an atrio-oesophageal fistula, esophageal damage or (persistent) phrenic nerve palsy, however the number of patients suffering from other gastrointestinal complaints afterwards is probably underestimated. In this case report, symptoms concordant with gastroparesis and presumably pylorospasm were observed less than 48 hours following the intervention. Gastroenterologists should be aware of uncommon complications, such as acute pylorospasm and gastric hypomotility. These are presumably mediated by direct nerve damage to parasympathetic efferent vagal branches. No large randomized control trials comparing different possible treatment modalities such as botulinum toxin, dilation, prokinetics and pyloric myotomy to one another have been published to our knowledge. This could be due to the low incidence of symptomatic post-PVI gastroparesis. However, several case reports and case series have been described concerning gastrointestinal motility disturbances after ablation (Table 1) (4,6-10).

In a study by Kanj et al, up to 17% of patients following RFA reported dysphagia or odynophagia following PVI; these numbers however could be significantly reduced by using a different type of ablation catheter (11). Numbers were confirmed in a more recent study, in which 18% of all complications following cryoballoon PVI were attributed to collateral nerve damage (overall complication rate 9 out of 66 patients): in 6 patients asymptomatic gastroparesis could be detected, as well as 5 cases of transient phrenic nerve palsy (4).

However, in a more extensive case series published by Kuwahara et al, only 11 out of 3695 patients that underwent PVI were diagnosed as having a perioesophageal vagal nerve injury, with symptoms such as vomiting, bloating and gastric pain occurring within 72 hours following the procedure. A diagnosis of gastric hypomotility was confirmed by means of gastrointestinal fluoroscopy in 10 out of these 11 patients (7).

Several risk factors for the development of perioesophageal vagal nerve injury can be identified. Overall, less injury (overall number as well as severity) is seen when using a catheter with a tip that is continuously irrigated (7,11). Monitoring the esophageal temperature, and stopping the procedure in time, significantly decreased the number of severe complications during PVI (7). The use of a cryoballoon does not result in a reduced percentage of gastroparesis, but these cases are usually mild and spontaneously recuperate. Using lower temperatures with the cryoballoon to isolate the inferior pulmonary veins in a small left atrium appears to be associated with an increased risk of gastroparesis (9). Anatomical risk factors have been identified, such as a shorter distance from the left atrium to the descending

Table 1. — Published case reports on (presumable) vagal nerve injury following pulmonary vein isolation

Author, year	Publication title	Results
Shah et al., J Am Coll Cardiol 2005 (6)	Acute pyloric spasm and gastric hypomotility: an extracardiac adverse effect of percutaneous radiofrequency ablation for atrial fibrillation.	4/367 patients treated with catheter ablation for AF developed symptoms due to acute pyloric spasm and gastric hypomotility. 2/4 spontaneous recovery, 1/4 endoscopic intra-pyloric botulinum toxin injection, 1/4 laparoscopic esophagojejunal anastomosis.
Guiot et al., J Cardiovasc Electrophysiol 2012 (3)	Collateral nervous damages after cryoballoon pulmonary vein isolation.	Prospective monocentric study: 66 consecutive patients who underwent cryoballoon PVI for symptomatic paroxysmal AF. Twelve complications (18%) attributing to collateral nervous damage were noticed in 9 patients: asymptomatic gastroparesis was observed in 6 patients (9%), transient phrenic palsy in 5 (8%), and symptomatic sinus tachycardia requiring beta-blocker treatment in 1 (1%).
Kuwahara et al., J Cardiovasc Electro-physiol 2013 (7)	Clinical characteristics and management of periesophageal vagal nerve injury complicating left atrial ablation of atrial fibrillation: lessons from eleven cases.	3695 patients with drug-resistant AF undergoing extensive PVI at a single institution. Gastric hypomotility was found in 10 and pyloric spasm in 1. IV erythromycin relieved symptoms in 5 patients, 1 with pyloric spasm underwent esophagojejunal anastomosis. Eight patients almost fully recovered within 40 days; 3 patients suffered from severe symptoms for 3-12 months - these received no per-procedural esophageal temperature monitoring.
Tsuboi et al., J Nippon Med Sch 2014 (8)	Anatomical factors associated with periesophageal vagus nerve injury after catheter ablation of atrial fibrillation.	VNI occurred in 5 patients (1.9%), gastric hypomotility in 3 patients, and acalculous cholecystitis in 2 patients, within 3 days after ablation, and all patients recovered completely within 2 weeks. Anatomical risk factors could be identified in these patients.
Aksu et al., Am J Cardiol 2015 (9)	Gastroparesis as a Complication of Atrial Fibrillation Ablation.	104 patients treated with PVI: CB in 58 patients and open-irrigated tip RF catheter in 46 patients. Gastroparesis was seen in 7 cases (6 CB and 1 RF). Clinically relevant gastroparesis is common but generally reversible with CB ablation, however damage may not be as reversible with RFA.
Kaneshiro et al., Europace 2018 (10)	Anatomical predisposing factors of transmural thermal injury after pulmonary vein isolation.	Age, gender, body mass index, left atrial diameter and volume index in echocardiography were not associated with nerve injury, whereas distance between the left atrium and aorta as well as a larger branching angle of the left inferior pulmonary vein were.

AF: atrial fibrillation, CB: cryoballoon, GH: gastric hypomotility, PVI: pulmonary vein isolation, RFA: radiofrequency ablation; VNI: vagal nerve injury.

aorta as well as a longer contact length between the left atrium and the esophagus (8,10). In a more recent review, the distance between the esophagus and the right inferior pulmonary vein ostium was the sole predictor of gastric hypomotility (12).

No randomized controlled trials have been published, to the best of our knowledge, on how one ought to manage gastroparesis and pylorospasm in these specific cases. Since most cases appear to be asymptomatic, treatment is usually not indicated. Spontaneous recovery is often observed in mild cases, be it with or without the administration of prokinetic drugs (6,9,13). Symptoms are in nearly all cases completely resolved six months following the ablative procedure. Oral intake is usually paused for up to three days, followed by the introduction of liquid and solid foods as tolerated by the patient (5). The main prokinetic drug of choice in these patients is erythromycin (7), always keeping the possibility of QT prolongation in mind. For more severe cases, intra-pyloric injection of botulinum toxin endoscopically with or without subsequent dilatation of the pyloric muscle can be attempted, in order to remedy delayed gastric emptying (5,6). Finally, gastric peroral endoscopic myotomy (G-POEM) has been emerging as a new

treatment technique for refractory patients. However, long-term clinical response was not met despite a high technical success rate (14).

In conclusion, gastroparesis and gastric hypomotility as well as pylorospasm are rare but probably underreported complications following pulmonary vein isolation, which is used in the management of atrial fibrillation. A conservative approach, which encompasses the pausing of oral intake as well as the administration of prokinetic drugs, can be attempted in mild cases. More severe cases may benefit from the intra-pyloric injection of botulinum toxin or the dilatation of the pyloric muscle. Screening for gastrointestinal side effects after undergoing PVI may help us to identify affected patients more rapidly.

Conflict of interest statement

None

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