

Mechanical esophageal deviation: an approach for pulmonary vein reconnection attributed to esophageal heating



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Introduction

Catheter ablation of atrial fibrillation (AF) can be associated with esophageal injury that can range from gastroesophageal motility disorders to catastrophic complications such as atri-esophageal fistula formation. Several strategies have been explored to reduce gastroesophageal injury during AF ablation, such as (i) empirical limits to the power and duration of ablation along the posterior wall, or (ii) luminal esophageal temperature (LET) monitoring. Fear of esophageal injury frequently results in modifications to the AF ablation lesion set that may negatively affect the long-term clinical success of the ablation procedure. We present a case that highlights the use of mechanical displacement of the esophagus as an approach to treat pulmonary vein reconnection due to limited ablation along the posterior wall because of esophageal heating.

Case report

A 65-year-old woman with a history of hypertension and obstructive pulmonary disease underwent left-sided-only pulmonary vein (PV) isolation in 2008 for paroxysmal AF at another facility. She presented 5 years later with shortness of breath related to an atypical atrial flutter with rapid rates. During a repeat procedure, the left PVs were reconnected. During reisolation of the left PVs, the flutter terminated. However, significant difficulty was encountered during ablation of the right PVs along the posterior wall because

of repeated elevations ($\geq 38.5^{\circ}\text{C}$) in the LET (Figures 1A and 1B). Ablation was therefore limited to 10–15 W for durations of < 15 seconds per lesion. The right PVs were eventually isolated. Four months later, the patient presented with a repeat episode of AF. She was scheduled for a third procedure. Given the suspicion of right PV reconnection along the posterior wall, we discussed the use of mechanical esophageal deviation to allow uninterrupted posterior wall ablation.

Under general anesthesia, transseptal access to the left atrium (LA) was obtained. Two long sheaths (8F SL-1 and Agilis; St Jude Medical, St Paul, MN) were placed in the LA. The left PVs were durably isolated; however, the right PVs were noted to be reconnected. Multielectrode mapping of the right PV antrum demonstrated that the earliest activation was along the posterior wall, where LET rises had been noted during the prior ablation (Figure 1B). As before, the baseline esophageal position was noted to be rightward.

As previously described,¹ a 32F thoracic chest tube (Atrium Medical, Hudson, NH) was inserted into the esophagus under fluoroscopy. Barium sulfate was injected through the lumen to delineate the internal border of the esophagus. Subsequently, a 14F soft aluminum intubating stylet (Mallinckrodt; Covidien, Mansfield, MA) was manually curved and inserted into the tube for deviation. A multisensor temperature probe (Circa S-Cath; Circa Scientific, Park City, UT) was also inserted into the esophagus for continuous LET monitoring. The stylet-tube apparatus was then manipulated to allow for leftward esophageal deviation. The right PVs were successfully isolated as a pair (Figures 2A and 2B) with uninterrupted radiofrequency ablation (25 W) along the entire posterior wall. No LET elevations occurred. The PVs remained isolated despite adenosine infusions (18 mg). The patient had minimal throat discomfort post procedure that resolved prior to discharge. She has remained arrhythmia free off drugs for 1.5 years.

Discussion

Patients undergoing AF ablation are at risk for esophageal thermal injury. The spectrum of injury ranges from

KEYWORDS Ablation; Atrial fibrillation; Esophageal deviation; Esophageal heating; Pulmonary veins isolation

ABBREVIATIONS AF = atrial fibrillation; LA = left atrium; LET = luminal esophageal temperature; PV = pulmonary vein (Heart Rhythm Case Reports 2016;2:190–192)

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KEY TEACHING POINTS

- Esophageal heating during ablation on the posterior wall may impact the durability of pulmonary vein isolation by limiting the power or duration of radiofrequency at these sites.
- Mechanical deviation of the esophagus may be employed to allow the operator to perform complete ablation on the posterior left atrial wall, thereby allowing for more durable pulmonary vein isolation.
- A combination of off-the-shelf thoracic tube and endotracheal stylet can be used for deviating the esophagus.

superficial ulceration to esophageal/gastric motility disorders and, rarely, catastrophic atrio esophageal fistula formation.

The incidence of endoscopically diagnosed thermal injury ranges from 2.2% to 48%.² LET monitoring is a commonly used approach to detect and prevent esophageal injury. However, such LET rises mandate interruptions in energy delivery that interrupt workflow and do not always prevent esophageal injury, including fistula formation.

We have previously demonstrated that esophageal mechanical deviation can be successfully performed and maintained during AF ablation using the abovementioned ‘off-the-shelf’ devices¹. Other approaches to mechanical displacement of the esophagus have also been described, but not consistently used, because of the inadequate amount of deviation.³ The technique described here allowed us to tailor the degree of displacement as needed, and importantly, allowed the deviation to be maintained during posterior wall ablation. Although the procedure was performed without complications in this report, larger studies are needed to fully assess its safety and efficacy.

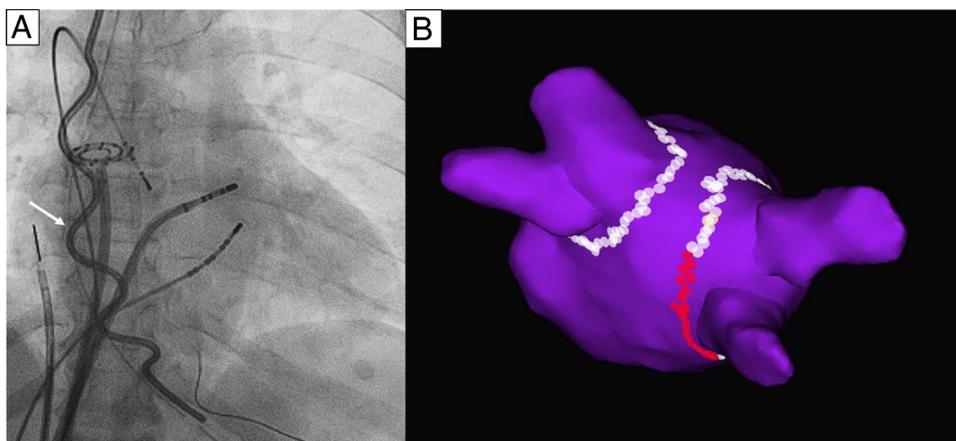


Figure 1 A: Fluoroscopic anteroposterior view during the second ablation procedure. The rightward esophagus is seen with the temperature probe in place (white arrow). B: A 3-dimensional left atrial map (posteroanterior view) demonstrating pulmonary vein isolation lesions—note the extensive area of esophageal heating during right posterior wall ablation annotated in red.

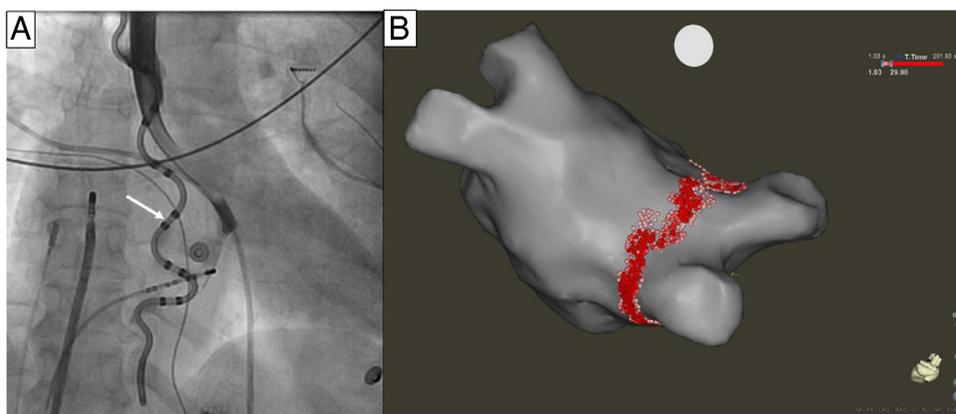


Figure 2 A: Fluoroscopic anteroposterior view showing leftward mechanical esophagus deviation during the final ablation procedure. The temperature probe (white arrow) is shown within the esophagus B: A 3-dimensional map of the left atrium (posteroanterior view) demonstrating uninterrupted right pulmonary vein isolation.

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