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Esophageal laceration Related To Mechanical Trauma from a General Purpose (Esophageal/Rectal) Temperature Probe Introducer Sheath During Atrial Fibrillation Ablation

Tawseef Dar[1], Bharath Yarlagadda[1], Cheen Alkhatib[2], Dhanunjaya Lakkireddy[1]

[1]Division of Cardiovascular Diseases, Cardiovascular Research Institute, University of Kansas Hospital and Medical Center, Kansas City, KS.
[2]Department of Anesthesiology, University of KansasHospital and Medical Center, Kansas City, KS.

Abstract

Catheter Radiofrequency ablation (RFA) for the management of atrial fibrillation (AF) can be associated with serious thermal injuries of the esophagus due to the close proximity of later. Use of Esophageal/Rectal temperature monitoring probes have become a standard practice now during these procedures in order to prevent such complications. However these probes need small introducer sheaths in order to guide them into the esophagus without coiling. Due to the small size of these sheaths, they can easily get dislodged into the trachea or esophagus and cause serious complications including mucosal lacerations.

Introduction

Pulmonaryveinisolation(PVI)usingtrans-catheter Radiofrequency ablation (RFA) is the standard of care for the management of atrial fibrillation (AF), especially in symptomatic patients with high AF burden[1]-[3]. Although relatively safe, AF ablation is associated with some serious esophageal complications due to the proximity to the left posterior atrial wall and PV ostia. Such complications include atrioesophageal fistulae, esophageal erythema, esophageal ulcerations and periesohageal nerve injury, collectively referred to as esophageal thermal lesions/Injuries (ETL/ETI)[4]-[7]. Incidence of esophageal thermal injuries (ETI) is reported around 20%[8] In an effort to achieve effective and long lasting electrical isolation of pulmonary veins (PV), high temperatures are usually reached during the ablation process which can conduct to the esophageal wall, thereby leading to different injuries. Interestingly, atrioesophageal fistula (AEF) usually develops after a period of 2-3 weeks after the procedure as the lesions mature, andatrioesophageal fistula is a life threatening complication[4]. Thus, strategies to prevent such complications are always actively sought by electrophysiologists (EP). Two commonly applied strategies to avert these undesirable complications during RFA are-accurate localization of the esophagus and continuous monitoring of the effects of ablation on the esophagus. The latter is achieved by use of an esophageal temperature monitoring (ETM) probe during the procedure. However, there has been a recent trend towards the use of General Purpose (GP) probes(esophageal/rectal probes) instead of conventional Esophageal Stethoscope (ES) to monitor esophageal luminal temperature (ELT) due to a notion that these probes are more sensitive. Such substitution can be wrought with complications as we describe in the case below.

Key Words

Ablation, Esophageal Injury, Laceration, Probes.

Corresponding Author
Dhanunjaya Lakkireddy,
Professor of Medicine Division of Cardiovascular Diseases, Cardiovascular Research Institute, University of Kansas Hospital and Medical Center, 3901 Rainbow Boulevard Kansas City, Kansas 6616.

Case

68 year old male with past medical history of coronary artery disease, hypertension (HTN), hyperlipidemia, obstructive sleep apnea (OSA), and recurrent AF status post ablation presented to the hospital for repeat RFAprocedure. As part of the procedure, patient hada GP (esophageal/rectal)probe placed in his esophagus to monitor ELT. But given the flimsiness of GP(esophageal/rectal probes) probe, a 30F nasal trumpet was inserted into the mouth as a sheath to guide the temperature probe into the esophagus. After unsuccessful placement due to coiling of the probe in the oropharynx, a small 5-0 F endotracheal tube (ET)was subsequently used due to its more rigid structure and length. Successful placement was confirmed by fluoroscopy and the procedure continued. During the procedure, the temperature probe is advanced and withdrawn for precise monitoring. RFA procedure was completed successfully but it was discovered that the ET had migrated into the esophagus when the surgical drapes were removed. The tube could not be visualized with direct and video laryngoscopy. The views were also obstructed due to the significant amount of barium in the oropharynx (used for the procedure).

Fluoroscopy localized the endotracheal tube within the thoracic region. Upper gastrointestinal (UGI) endoscopy was done to retrieve

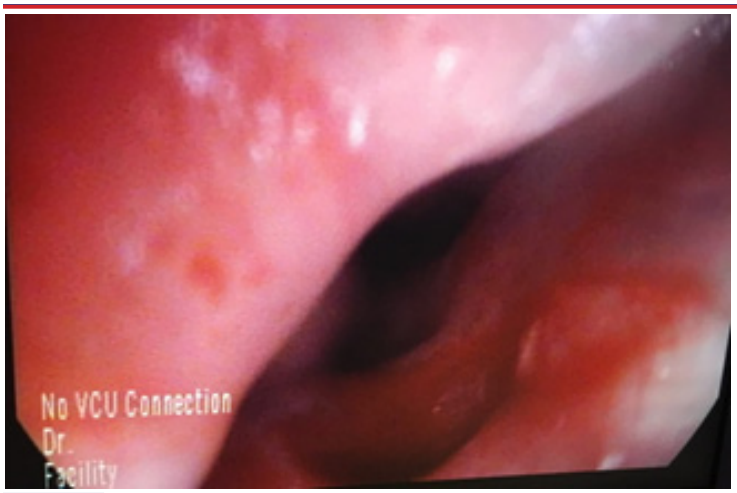

Figure 1: Endoscopic evidence of partial mucosal injury of the Esophagus

the ET. The proximal end of the ET was visualized just below the cricopharygeus and had caused a mucosal injury with a partial disruption underneath the upper esophageal sphincter [Figure 1].

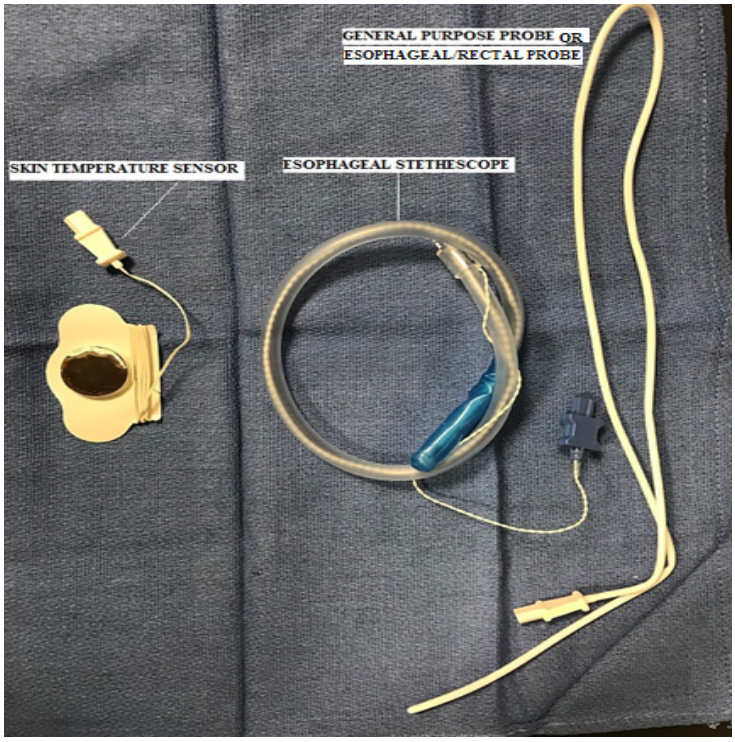

Figure 2A: Showing different types of Temperature sensors

In the process of retrieving the ET, further mucosal injury of the esophagus incurred. Post procedure endoscopy demonstrated a deep, partial-thickness laceration of the proximal esophagus with no signs of active bleeding. Patient was kept in the hospital for an additional 24 hours and was discharged in stable condition.

Discussion

ELT monitoring has become a standard practice during the RFA procedure for AF in an effort to avoid ETI, especially life threatening AEF. Modern RFA techniques for AF have achieved higher success ratesalong with a reduction in pulmonary vein stenosis, albeit with an increased risk for AEF[3].Using the esophageal temperature monitoring system, ablation is controlled by setting an upper limit to the esophageal intraluminal temperature. Ablation is stopped anytime temperature monitor hits that point and is resumed at a lower energy. The set upper limit temperature varies (39-41 C) between different institutions, clinicians and with patient characteristics[9]. Off note, the utility of these temperature monitoring probes in preventing esophageal injuries is still debated with some studies even showing that the use of these probes, in the setting of RFA, are associated with esophageal injuries[10]. General consensus, however, still favors their

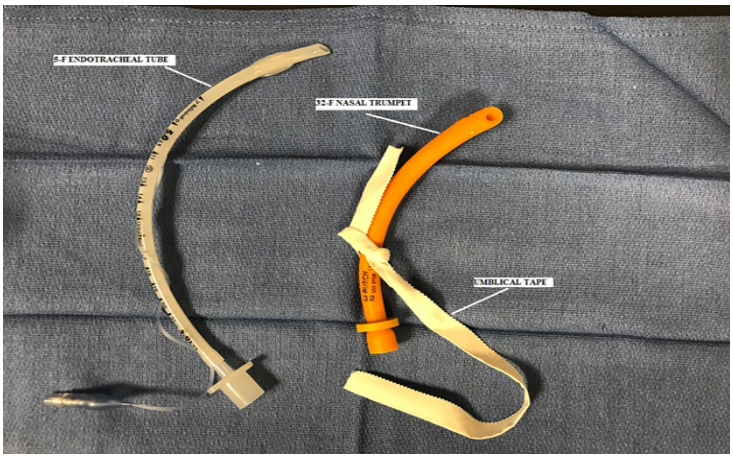

Figure 2B Showing different types of Devices used as Sheaths for General Purpose (GP) probes ((esophageal/rectal probes)

use during catheter ablation procedures for AF. Some clinicians and institutions have taken a step further and are using GP(esophageal/rectal probes) probes, originally designed for rectal/nasopharyngeal temperature monitoring, in place of conventional ES for ELT monitoring during AF ablation procedures. The rationale provided is that these GP(esophageal/rectal probes)probes are more sensitive to temperature changes than ES. However,due to their inherent flimsiness, GP(esophageal/rectal probes)probes often need a sheath to guide them into the esophagus. Usually a 30F nasal trumpet or a small 5-0 F ET is used for such purposes [Figure 2A and 2B].Such practice can result in serious adverse events if these devices (sheaths) migrate toward the trachea or esophagus while manipulating the temperature probe, as happened in our case.

Conclusion

The trend of using GP(esophageal/rectal probes)probes for esophageal monitoring should be reviewed in order to find a reasonable rationale, backed with substantial evidence, for their use. If their use is rational,then efforts should be made to design sheaths to allow safe and easy manipulation of such probes in and out of the esophagus during the procedure. Meanwhile, great caution should be exercised at present while we continue to use small ET tubes as sheaths for such probes to avoid serious adverse consequences.

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