

CASE REPORT

CLINICAL CASE SERIES

Buckled Transesophageal Echocardiography Probe



A Stepwise Approach to Diagnosis and Management of a High-Risk Complication

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ABSTRACT

BACKGROUND Buckling of a transesophageal echocardiography (TEE) probe is a rare but potentially life-threatening complication that carries a significant risk of esophageal perforation.

CASE SUMMARY We report 3 cases of buckled TEE probes that were promptly recognized, diagnosed, and managed using multimodal imaging. In each instance, the location of the buckled probe was confirmed with bedside imaging. Subsequently, the patient was taken to the interventional suite for advancement of the probe to the stomach under fluoroscopic guidance. Finally, the buckled TEE probe was straightened and removed successfully from the patient without difficulty.

DISCUSSION Early recognition of buckled TEE probes and employment of a structured, algorithmic management approach are essential to optimizing outcomes and preventing associated morbidity and mortality.

TAKE HOME MESSAGES Buckling of the TEE probe requires a high index of suspicion and prompt diagnosis to prevent catastrophic complications such as esophageal perforation. Advancement of the TEE probe in the stomach under fluoroscopic guidance facilitates straightening and removal of the probe without the risk of esophageal perforation. (JACC Case Rep. 2026;■:108882) © 2026 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Transesophageal echocardiography (TEE) is a widely used imaging modality in cardiovascular care. Major complications and adverse events associated with TEE are rare, ranging from 0.4% to 1.4%.^{1,2} Buckling of the TEE probe, first described in 1992 by Kronzon et al,³ is one such complication, in which the distal portion of the probe

bends back toward itself in extreme flexion within the esophagus, forming a U-shape. Although the risk of buckling is present with all TEE probes, it may be increased when using mini-multiplane (“pediatric”) TEE probes in adult patients because of their smaller caliber and more flexible probe tips. Proper management of this condition is paramount,

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**ABBREVIATIONS
AND ACRONYMS****TEE** = transesophageal
echocardiography

as further attempts to advance or withdraw the TEE probe against resistance may lead to esophageal mucosal trauma, bleeding, or perforation in catastrophic cases. Here, we present to our knowledge the first case series illustrating probe buckling during TEE in adult patients with the use of a pediatric TEE probe, describing a standardized approach for safe diagnosis and management.

CASE SUMMARIES

Each TEE examination was performed by a trained and experienced operator according to the manufacturer's guidelines. The operators were different in each of the 3 cases.

CASE 1. A 38-year-old man with no known medical history presented to the emergency department after 6 days of fever, sore throat, weakness, and a syncopal episode. Blood cultures returned positive for *Streptococcus mitis*. Intravenous ampicillin/sulbactam was initiated, and transthoracic

TAKE-HOME MESSAGES

- Buckling of the TEE probe requires a high index of suspicion and prompt diagnosis to prevent catastrophic complications such as esophageal perforation.
- Advancement of the TEE probe in the stomach under fluoroscopic guidance facilitates straightening and removal of the probe without the risk of esophageal perforation.

echocardiography did not reveal any significant valvular abnormality or vegetations. The patient continued to fever despite receiving appropriate antibiotics and was subsequently referred for a TEE to evaluate for infective endocarditis.

The patient underwent moderate sedation with intravenous midazolam and fentanyl. A Philips S7-3t mini-multiplane TEE probe was selected because of the patient's history of acute pharyngitis and

VISUAL SUMMARY Summary of Risk Factors, Clinical Signs, and Management of Buckled TEE Probes**Overview**

Buckling of the TEE probe is a rare but potentially life-threatening complication due to the risk of esophageal perforation.

Risk factors

- Non-midline intubation
- Structural GI abnormalities
- Usage of a pediatric TEE probe in an adult patient

Signs of TEE Probe Buckling

- Inability to obtain TEE image
- Inability to advance or withdraw probe without resistance
- TEE probe fixed in maximum flexion

Management**Immediate Imaging for Diagnosis:**

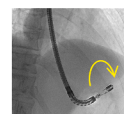
- Chest X-ray
- Fiberoptic endoscopy
- Fluoroscopy

**Steps to Unbuckle TEE Probe Under Fluoroscopic Guidance:**

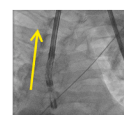
Advance TEE probe below the diaphragm



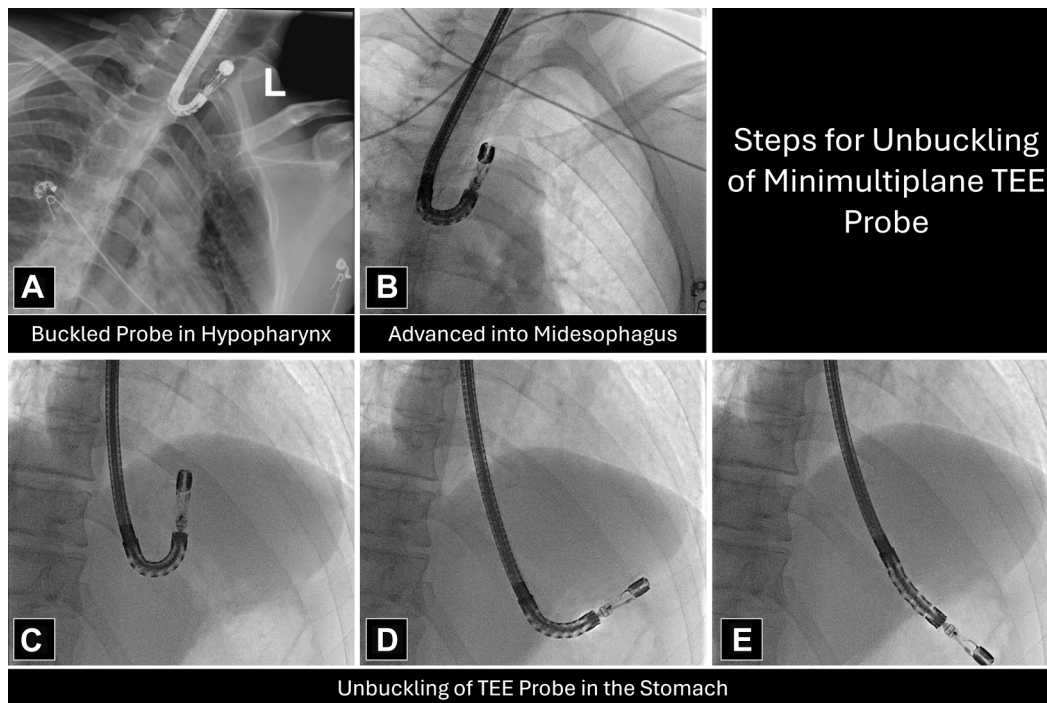
Straighten TEE probe in the stomach



Withdraw probe from patient



GI = gastrointestinal; TEE = transesophageal echocardiography.

FIGURE 1 Case 1 *Streptococcus mitis* Bacteremia

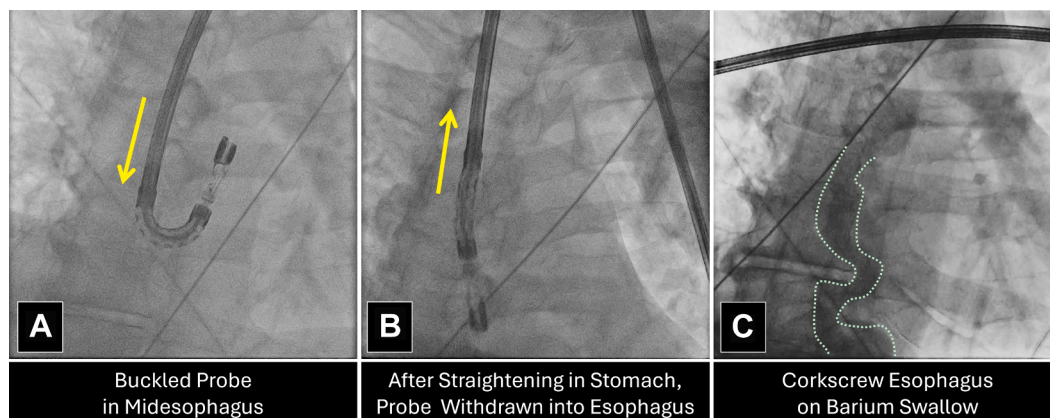
Once buckling of the TEE probe was suspected, a chest x-ray was immediately obtained (A), demonstrating the U-shaped probe in the hypopharynx. The patient was taken to the interventional suite, and the buckled TEE probe was advanced under fluoroscopic guidance into the midesophagus (B) and below the diaphragm into the stomach (C). The TEE probe was then straightened (D and E) and subsequently removed from the patient. TEE = transesophageal echocardiography.

tonsillar exudate. After passage of the probe into the proximal esophagus, the probe could not be advanced or withdrawn without resistance, raising concern of buckling. An emergent chest x-ray was obtained, confirming the diagnosis of a buckled TEE probe (Figure 1A). The patient was taken promptly to the interventional suite, where the probe was advanced to the stomach, straightened under fluoroscopic guidance, and removed from the patient without difficulty (Figures 1B to 1E, Video 1).

CASE 2. A 61-year-old man with a history of gastroesophageal reflux disease and paroxysmal atrial fibrillation presented for elective atrial fibrillation ablation. Preprocedural TEE was ordered per protocol to rule out left atrial appendage thrombus. After administration of conscious sedation, an adult TEE probe could not be advanced into the esophagus despite multiple attempts. A Philips T6207 mini-multiplane TEE probe was then selected and was advanced easily into the esophagus. After reaching about 35 cm from the incisors, the TEE probe could neither be advanced further nor retracted

without resistance, raising suspicion for buckling of the TEE probe. The patient was taken promptly to the interventional suite, where fluoroscopy demonstrated U-shaped buckling of the probe in the midesophagus (Figure 2A). Under fluoroscopic guidance, the probe was advanced into the stomach, unbuckled, and withdrawn from the patient without difficulty (Figure 2B). Afterward, oral contrast challenge demonstrated a corkscrew esophagus without evidence of contrast extravasation into the periesophageal space (Figure 2C).

CASE 3. An 83-year-old man with paroxysmal atrial fibrillation and subsequent cardioversion, prior surgical mitral valve annuloplasty, and recent implantation of a transcatheter left atrial appendage occlusion device presented for a TEE to re-evaluate a previously identified paradevice leak. Intubation with a standard adult-sized TEE probe was unsuccessful because the patient could not swallow the probe. A Philips S7-3t mini-multiplane TEE probe was subsequently selected and was advanced to 30 cm past the incisors but then encountered resistance

FIGURE 2 Case 2 Atrial Fibrillation Ablation

Fluoroscopic images demonstrating (A) advancement of the buckled probe further into the midesophagus toward the stomach, and (B) withdrawal of the straightened probe after unbuckling in the stomach. (C) Barium swallow under fluoroscopy demonstrating a corkscrew esophagus, which increases the risk of buckling of the TEE probe. TEE = transeophageal echocardiography.

with attempts to advance or withdraw the probe. Buckling of the TEE probe was suspected.

Chest radiography was immediately obtained, which confirmed the U-shaped conformation of the probe. However, there was uncertainty as to whether the buckled tip of the TEE probe lay in the esophagus or the hypopharyngeal piriform sinus (Figures 3A and 3B). The otolaryngology service was consulted and performed fiberoptic endoscopy, which confirmed the location of the probe within the esophagus. The patient was then transported expediently to the interventional suite. Under fluoroscopic guidance, the buckled TEE probe was advanced into the stomach, unbuckled, and removed from the patient without difficulty (Figures 3C and 3D).

DISCUSSION

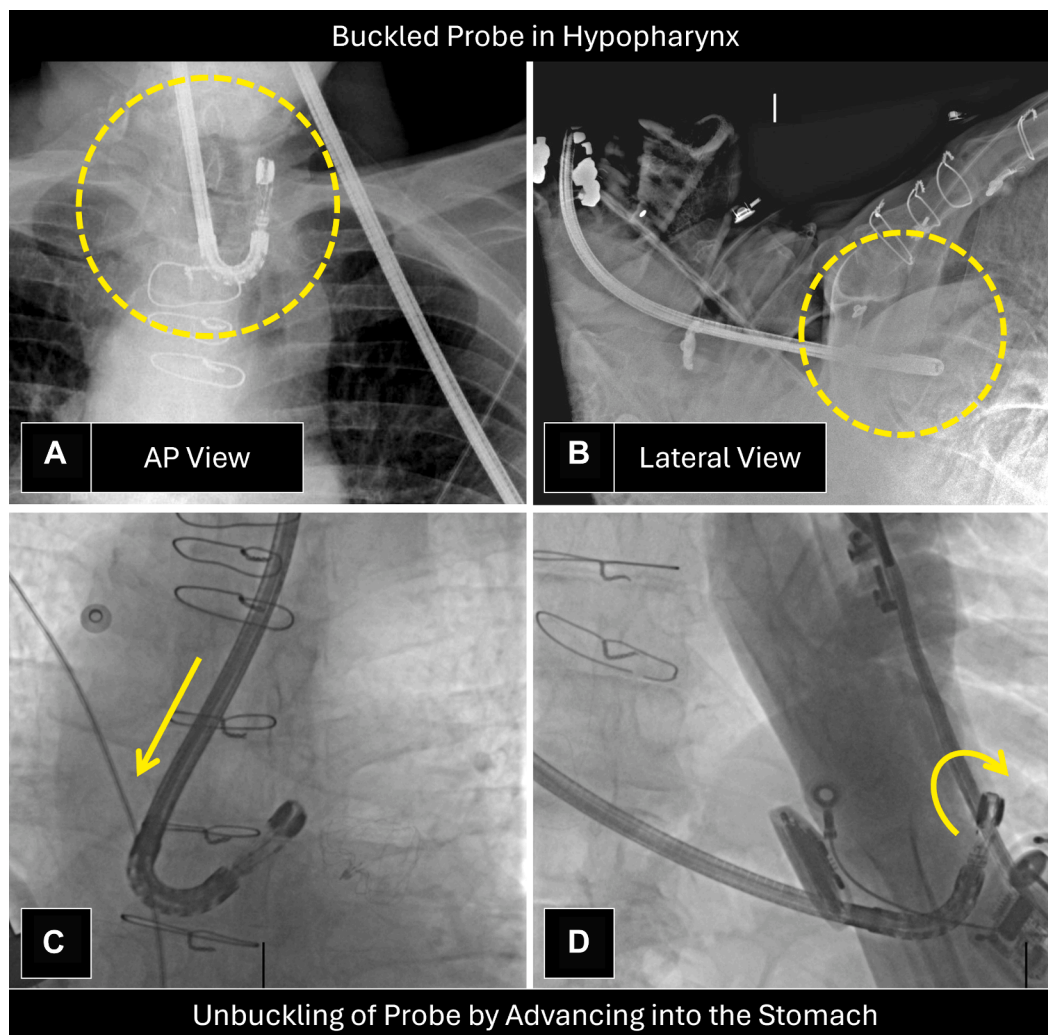
Early recognition of buckling of a TEE probe is of utmost importance, as further attempts to forcibly remove or straighten a buckled probe can result in esophageal mucosal damage or perforation. Clinicians must maintain a high index of suspicion for these complications because esophageal perforation often lacks obvious clinical signs. In fact, Mackler's classic triad of esophageal perforation (vomiting, thoracic pain, and subcutaneous emphysema) was found to be present in only 17% of cases.¹ In each of the cases presented here, several common factors raised the operators' suspicions for buckling of the TEE probe: use of a pediatric TEE probe in an adult patient, inability to obtain expected TEE

images, resistance to advancing or withdrawing the TEE probe, and having the probe rigidly fixed in maximum flexion.³

Beyond these signs, certain anatomical and procedural factors may increase the risk of probe buckling. Structural gastrointestinal abnormalities such as esophageal stricture, corkscrew esophagus, and diverticula can predispose patients to this complication. In addition, if the probe is not centered along the midline during intubation, it may be diverted into the pyriform fossa rather than the posterior pharynx,⁴ and further advancement of the probe may cause the probe to bend into a U-shaped conformation.

Once buckling of the probe is suspected, immediate imaging is required to confirm the diagnosis and to localize the probe tip. In 2 of our cases, this was easily confirmed with portable chest x-ray. However, if diagnostic uncertainty remains, direct visualization with fiberoptic endoscopy may be necessary to confirm probe location, as seen in our third case. Special care should also be taken to look for clinical or radiographic signs of subcutaneous emphysema, which may portend an underlying esophageal perforation.

After confirmation of the TEE probe location, the patient should be transported promptly to the interventional suite for probe unbuckling under fluoroscopic guidance. The buckled TEE probe is gently advanced until the probe tip is visualized below the diaphragm, signifying entry into the stomach. Here, the larger lumen of the gastric fundus

FIGURE 3 Case 3 Follow-Up of Left Atrial Appendage Occlusion Device Paradevice Leak

Chest x-rays in the (A) anteroposterior (AP) view and (B) lateral view demonstrating a buckled TEE probe overlying the hypopharynx. (C) Fluoroscopic image illustrating advancement of the TEE probe into the midesophagus. (D) Fluoroscopy in the left anterior oblique caudal view demonstrating unbuckling of the TEE probe below the diaphragm. The TEE operator's hand is seen superimposed on the unbuckled TEE probe. TEE = transesophageal echocardiography.

provides the necessary space to safely straighten the probe using the anteflexion/retroflexion knob. The straightened TEE probe can then be safely withdrawn back into the esophagus and out of the patient. Oral contrast challenge or serial chest x-rays can be used to identify delayed complications, such as esophageal perforation or mediastinitis.

Upon reviewing the literature, we found several reports of buckling of the TEE probe with the use of standard adult-sized TEE probes in both anaesthetized patients and patients undergoing conscious sedation (Table 1).^{3,5-8} In these studies,

flaccidity of the probe and the use of general anesthesia were proposed as potential risk factors for TEE probe buckling. In anaesthetized patients, midline esophageal intubation may be impeded by the position of the tongue in the supine position, as well as the presence of an endotracheal tube. In addition, the depth of sedation and consequent relaxation of the pharyngeal constrictors may mask potential patient responses that may otherwise alert operators to a complication related to TEE probe intubation.

We propose an additional risk factor for probe buckling: the use of a mini-multiplane TEE probe in

TABLE 1 Literature Review of Reported Cases of Buckled Probes

First Author (Year)	Number of Cases	Sedation	Probe Type (Manufacturer, Model)	Risk Factors for Probe Buckling	Management Approach
Kronzon et al ³ (1992)	4	Conscious sedation	Adult TEE probe (Hewlett Packard, 21362A)	Wear and tear of probe steering cables	Advancement of probe into stomach
Orihashi et al ⁵ (1993)	6	General anesthesia	Adult TEE probe (Aloka, UST-5225V-5)	General anesthesia, angled insertion	Advancement of probe into stomach
Ozer et al ⁶ (2009)	1	General anesthesia	Not specified	General anesthesia	Advancement of probe into stomach
Andersen et al ⁷ (2011)	1	Conscious sedation	GE Healthcare; type and model not specified	Excessive probe rotation during transgastric imaging	Advancement of probe into stomach by EGD
Dişibeyaz et al ⁸ (2012)	1	Conscious sedation	Not specified	N/A	Advancement of probe into stomach by EGD
This case	3	Conscious sedation	Pediatric TEE probe (Philips, S7-3t and Philips, T6207)	Pediatric TEE probe in adult patient	Advancement of probe into stomach

EGD = esophagogastroduodenoscopy; TEE = transesophageal echocardiography.

adult patients. The risk of probe buckling in this subset of patients is likely increased given the combination of the smaller caliber TEE probe and larger esophageal lumen. However, it is important to recognize that this complication can occur with any size TEE probe, especially if other risk factors for probe buckling are present.

Advancement of the TEE probe into the esophagus under fluoroscopic guidance is the preferred management of this complication, with zero reported adverse outcomes associated with this maneuver. In addition, 2 studies reported gastroenterology consultation for esophagogastroduodenoscopy assistance in advancing the TEE probe into the stomach.^{7,8} This alternative approach may be employed if manual advancement of the TEE probe is not possible.

CONCLUSIONS

Buckling of the TEE probe is a rare but potentially catastrophic complication that requires prompt recognition to prevent severe esophageal injury. Diagnosis depends on maintaining a high index of

suspicion, particularly when using smaller caliber probes in adult patients, and obtaining immediate bedside imaging. Safe management involves advancement of the TEE probe to the stomach under fluoroscopic guidance for unbuckling within the larger gastric lumen. Adopting this structured, step-wise approach is essential to ensuring patient safety and optimizing outcomes.

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KEY WORDS complication, echocardiography, imaging

APPENDIX For a supplemental video, please see the online version of this paper.