

A Sticky Situation: The Unfortunate Consequence of Chewing Gum



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INTRODUCTION

Echocardiographic imaging artifacts are common, and poor recognition of these artifacts may lead to adverse outcomes. Echocardiographic artifacts are generated through external interference (i.e., ultrasound interference, ventricular assist devices), internal violations of assumptions made by ultrasound equipment (i.e., mirror image, reverberation artifacts), or mechanical failure (i.e., transducer malfunction).¹ For transesophageal echocardiograms (TEEs), poor probe contact, transducer shutdown due to overheating, and foreign devices or substances interfering with the TEE probe tip should also be considered as causes of imaging artifact. Recognition and identification of these artifacts are important as poor identification can lead to imaging misinterpretation, procedural delays, unnecessary interventions, and, potentially, patient harm. We present a case of a “sticky” and unusual cause of an echocardiographic artifact.

CASE PRESENTATION

A 69-year-old man was referred for placement of a left atrial appendage occlusion (LAAO) device due to high-risk occupational hazards of bleeding on oral anticoagulation. The patient’s medical history included paroxysmal atrial fibrillation, hypertension, peripheral vascular disease, and a transient ischemic attack.

The patient presented for the LAAO device procedure having had nothing to eat or drink since the prior evening. Preprocedural vital signs were blood pressure 151/74 mm Hg, heart rate 58 bpm, and oxygen saturation 98% on room air. They were afebrile. Cardiac auscultation revealed an irregular rhythm without murmurs or gallops. The remainder of the examination was unremarkable.

The patient was subsequently intubated without difficulty for the procedure, and a TEE probe was placed without resistance or difficulty in the midesophageal position. Initial midesophageal TEE views at a depth of between 30 and 35 cm were notable for diffuse anechoic images without any identifiable cardiac structures (Figure 1, Video 1). Given the relatively common occurrence of swallowed trapped air

leading to poor TEE image quality, different troubleshooting mechanisms involved manipulation of TEE probe depth or flexion. However, there was no difference in TEE image quality with TEE probe manipulation or with changes in multiple echocardiographic machine settings (i.e., adjusting the gain, depth).

The patient remained on minimal ventilator settings without evidence of respiratory compromise throughout the initial attempted TEE image acquisition. Suspecting a TEE probe malfunction, the TEE probe was subsequently removed, with the plan to switch to a new TEE probe. However, upon removal, we were surprised to find a piece of chewing gum stuck to the tip of the TEE probe, covering the piezoelectric crystal (Figure 2). At that point, the anesthesia team noted that the patient had been chewing gum preprocedurally and when they were asked to spit out the gum, they refused and had proceeded to swallow it. The piece of gum was removed from the tip of the probe, and upon subsequent replacement of the TEE probe in the midesophagus, the patient’s left atrial appendage was well visualized without evidence of thrombus (Figure 3, Video 2). The patient’s LAAO device procedure was ultimately successful.

DISCUSSION

This was the first time in our clinical practice that the cause of a TEE artifact was proven to be caused inadvertently by a piece of chewing gum that coated the piezoelectric crystal of the TEE probe, creating a diffusely anechoic, uninterpretable image. Although the patient claimed to have swallowed their gum prior to the procedure, against medical advice, the likelihood is that the piece of gum was still in either their oral cavity or posterior oropharynx and subsequently coated and stuck to the tip of the TEE probe as it was being placed in the esophagus. Although this led to a small procedural delay, the patient was still able to have the LAAO device successfully implanted with TEE imaging guidance.

Although we were able to rapidly identify the reason for our poor TEE image quality because we were able to visualize the patient’s gum on the tip of the TEE probe, there would have been considerable difficulty in diagnosing the etiology of our poor TEE image quality if the gum had fallen off the probe during probe removal. Other potential reasons for our technical failure included a mechanical error involving the TEE probe piezoelectric crystal, issues with electrical circuitry, or an ultrasound mechanical error, and our next step would have been to replace the TEE probe.² Transesophageal echocardiogram probe malfunctions have not been commonly reported in the literature, although it is apparent that TEE probes should be tested regularly to identify defective probes.³ Anatomical differences, issues with probe contact, and inadvertent tracheal intubation were also considered, although no amount of probe maneuvering led to improved image generation. Inadvertent tracheal intubation may have a similar appearance, with diffusely anechoic and limited or intermittently poor image quality, although tracheal intubation is often associated with coughing, desaturation, and resistance to probe advancement.^{4,5}

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Keywords: Transesophageal echocardiogram, Echocardiography, Echocardiogram artifacts, Chewing gum

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VIDEO HIGHLIGHTS

Video 1: Initial video of midesophageal TEE view at a depth of between 30 and 35 cm showing diffuse anechoic images.

Video 2: Video of well-visualized LAA without evidence of thrombus in the midesophageal TEE view at 90° following removal of chewing gum from the tip of the TEE probe.

[View the video content online at www.cvcasejournal.com.](http://www.cvcasejournal.com)

Transesophageal echocardiogram transducer shutdown due to elevated transducer temperatures (>42°C to 44°C) during prolonged use or in severely febrile patients is initiated to prevent thermal burns and patient injury; however, this was not the case in our patient as the patient was afebrile and the TEE probe temperature was <37°C.^{2,6}

Most commonly, echocardiographic artifacts and pitfalls during TEE are usually caused by internal violations of assumptions made by ultrasound equipment and are usually associated with multiple and misplaced reflections due to calcified tissue, reflective wires or catheters, or prosthetic material.^{7,8} External interference with the TEE probe can be caused by indwelling esophageal devices, such as nasogastric and orogastric tubes, and these should be removed prior to a planned TEE. As seen in our case, chewing gum and any other opaque substance can also coat the TEE probe tip, causing unforeseen issues with echocardiographic image quality and potentially leading to procedural delays or adverse patient outcomes.⁹

Although TEEs are commonly performed,¹⁰ documentation regarding technical malfunction and suboptimal image quality due to external interference is sparse. We chose to capture and document our personal experience with our patient's chewing gum interfering with the TEE probe, not only due to the rarity of the event, but also because documentation of these occurrences ensures operator education and awareness of potential consequences and pitfalls; this ultimately helps to drive guideline practice recommendations. Although the 2023 American Society of Anesthesiologists Practice Guidelines for Preoperative Fasting allow for chewing gum prior to an anesthetic, there is no consensus statement regarding managing a patient who swallows their chewing gum. We elected to proceed with anesthetic administration because the aspiration risk was assessed to be low (akin to swallowing preoperative medications).¹¹ However, based on our experience, chewing gum should never be allowed to be swallowed in the preprocedural setting and should be removed prior to anesthetic administration and TEE probe placement. Transesophageal echocardiogram operators should be encouraged to routinely inspect the TEE probe tip upon removal of the probe to assess for damage to the probe or coating of the probe tip with any foreign substances regardless of image quality; capturing these images is of paramount importance to educate both our peers and future operators.

CONCLUSION

Although not a typical cause of a TEE artifact, chewing gum coating the TEE probe piezoelectric crystal led to poor and uninterpretable echocardiographic images that normalized once the gum was removed from the tip of the probe. Other potential reasons for poor TEE image quality include mechanical failure (with the transducer, electrical circuitry, or ultrasound machine itself), patient

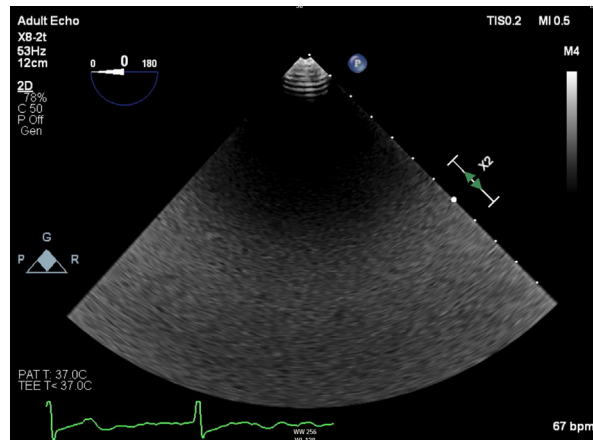


Figure 1 Initial midesophageal TEE view at a depth of between 30 and 35 cm showing diffuse anechoic images.

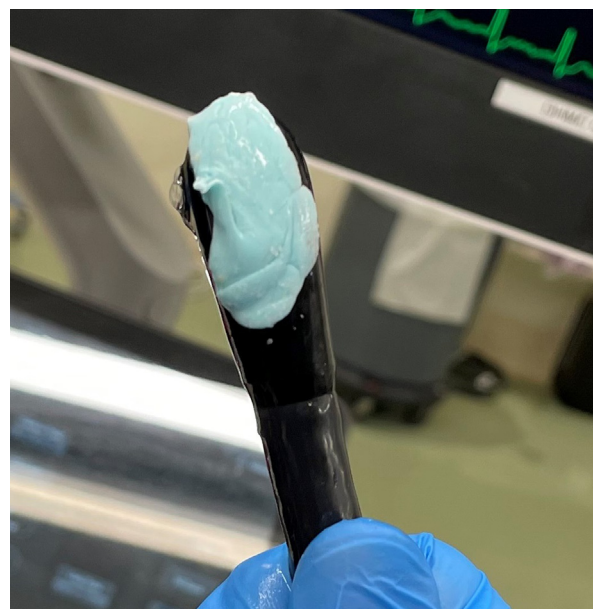


Figure 2 Transesophageal probe with the patient's chewing gum covering the tip of the probe.

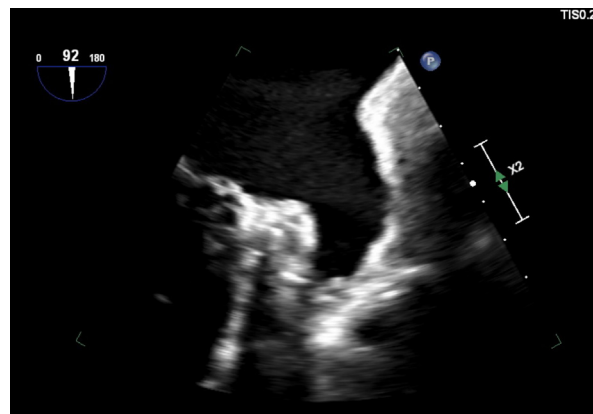


Figure 3 Well-visualized left atrial appendage without evidence of thrombus with midesophageal TEE views at 90°.

anatomy, probe contact, elevated probe temperatures, or other external interference. Physicians and sonographers should be aware of the potential reasons for poor TEE image quality as lack of recognition could lead to adverse patient outcomes.

ETHICS STATEMENT

The authors declare that the work described has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans.

CONSENT STATEMENT

Complete written informed consent was obtained from the patient (or appropriate parent, guardian, or power of attorney) for the publication of this study and accompanying images.

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DISCLOSURE STATEMENT

The authors report no conflict of interest.

SUPPLEMENTARY DATA

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.case.2023.02.005>.

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