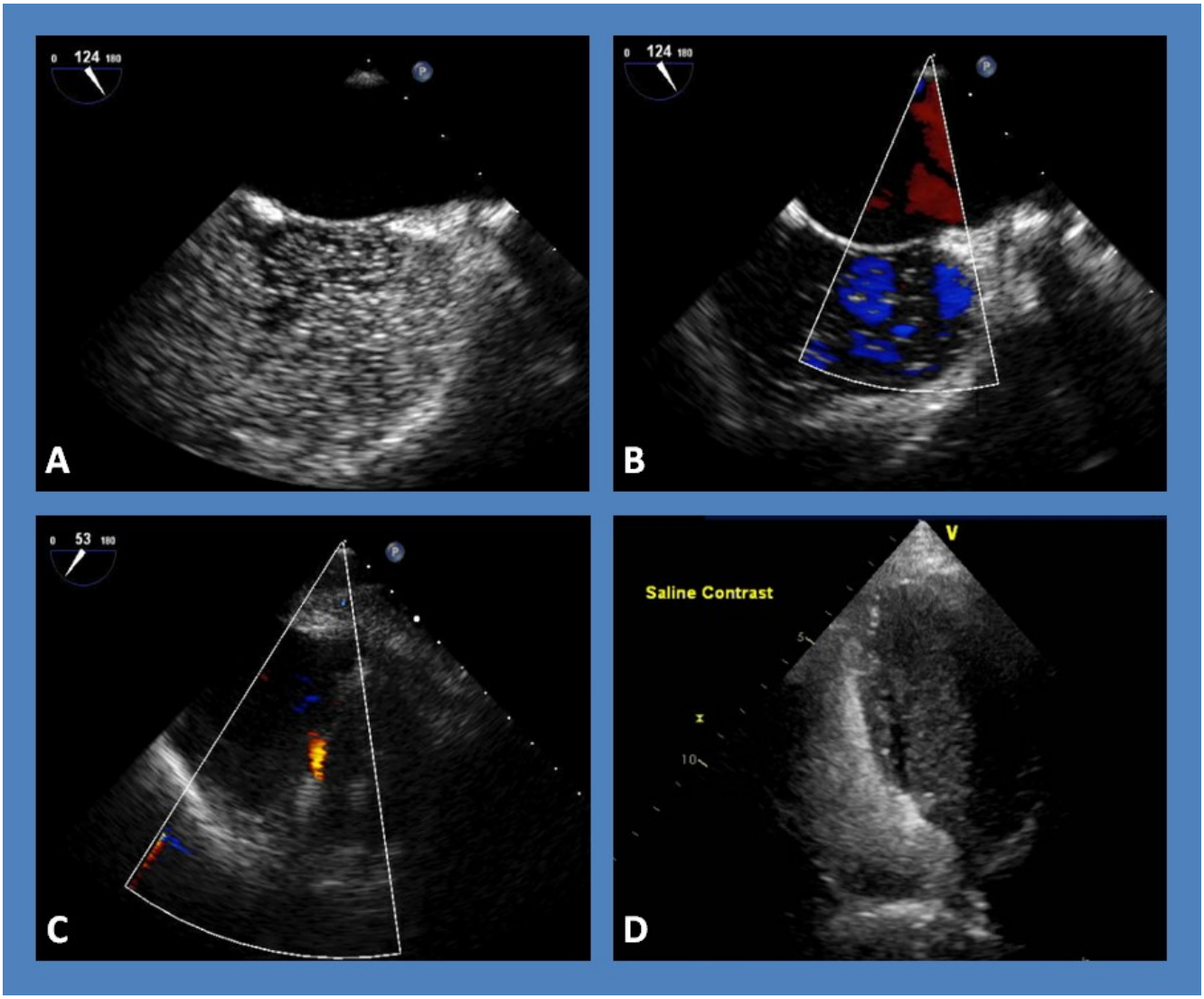
# Elusive PFO! *Deep Transgastric Clue on TEE!*

Nupur Shah, M.D.[a], Rajasekhar Mulyala, M.D.[a], Mustafeez Ur Rahman, M.D.[a], Mariam Raid, M.D.[a], Bassam Omar, M.D., Ph.D.[a, b], Christopher Malozzi, D.O.[a]




## Description

The above echocardiographic images were obtained as part of work-up for cardiac source of embolus in the setting of a transient ischemia attack (TIA). Transesophageal (TEE) Mid-esophageal bicaval views with IV agitated saline (bubble) contrast (panel A) and color flow Doppler (panel B) failed to demonstrate any shunting. Valsalva maneuver was performed, but was limited by the patient's sedated status. Deep transgastric imaging with sufficient rightward rotation to visualize the inter- atrial septum in a vertical view was obtained using a 53 degree angulation [panel C]. Color Doppler clearly demonstrated left to right shunting. The bubble study was repeated at a later time without any sedation and using apical 4-chamber transthoracic echocardiography (TTE) views, demonstrating brisk Valsalva-induced right-to-left shunting across the inter-atrial septum [panel D].

ISSN 2689-291X https://doi.org/10.13140/RG.2.2.25933.04325

## Discussion

Transesophageal echocardiography remains an indispensable tool in the diagnosis of a cardiac source of embolus, and can yield important findings affecting treatment decisions in patients presenting with acute embolic phenomena, especially ischemic stroke or transient ischemic attack [1]. Complex aortic plaque was the most common TEE finding associated with stroke in one published report, followed by patent foramen ovale [2]. However, TEE may miss PFOs by a negative bubble study in approximately 10% of the cases [3]. This could conceivably be due to ineffective Valsalva maneuver in small shunts while under sedation as in the case above.

Guidelines for the performance of a comprehensive TEE in the setting of congenital heart disease [4] stress the importance of adequate visualization and interrogation of the inter-atrial septum from the mid-esophageal 4-chamber views, mid-esophageal bicaval views and deep transgastric septal views in order to identify an atrial septal defect or a PFO. Our case demonstrates the importance of deep transgastric views of the inter-atrial septum at approximately 50 – 60 degrees, as it aligns the septum vertically and allows the left-to-right shunt flow across a PFO to be parallel to the ultrasound probe, thereby yielding more accurate PFO detection than in the mid-esophageal bicaval view, where the shunt flow is more likely to be perpendicular to the imaging probe.

A properly performed Valsalva maneuver is an essential component of a bubble study on TEE [5]. However, performance of a TEE under conscious sedation may limit a patient's ability to cooperate and perform an adequate Valsalva maneuver. A cough maneuver may be more helpful when mild degree of shunting is suspected [6]. Repeating a Valsalva maneuver using a TTE while the patient is fully awake and cooperative may help yield shunting not otherwise detectable during TEE.

Manuscript submitted March 6, accepted March 22, 2024

a Division of Cardiology. University of South Alabama, Mobile, AL 36617

b Corresponding Author: Bassam Omar, Division of Cardiology, University of South Alabama, 2451 USA Medical Center Dr., Mobile, AL 36617, USA.

Email: bomar@health.southalabama.edu

https://cardiofellows.com/newsletter-march-2024.html

## References

1. Thomalla G, Upneja M, Camen S, Jensen M, Schröder J, Barow E, Boskamp S, Ostermeier B, Kissling S, Leinisch E, Tiburtius C, Clausen H, Cheng B, Blankenberg S, Nedelmann M, Steinbrecher A, Andres F, Rosenkranz M, Sinning C, Schnabel RB, Gerloff C. Treatment-Relevant Findings in Transesophageal Echocardiography After Stroke: A Prospective Multicenter Cohort Study. Stroke. 2022 Jan;53(1):177-184.

2. Shah S, Malik P, Patel U, Wang Y, Gronseth GS. Diagnostic Yield of TEE in Patients with Cryptogenic Stroke and TIA with Normal TTE: A Systematic Review and Meta-Analysis. Neurol Int. 2021 Dec 1;13(4):659-670.

3. Mojadidi MK, Bogush N, Caceres JD, Msaouel P, Tobis JM. Diagnostic accuracy of transesophageal echocardiogram for the detection of patent foramen ovale: a meta-analysis. Echocardiography. 2014 Jul;31(6):752-8.

4. Puchalski MD, Lui GK, Miller-Hance WC, Brook MM, Young LT, Bhat A, Roberson DA, Mercer-Rosa L, Miller OI, Parra DA, Burch T, Carron HD, Wong PC. Guidelines for Performing a Comprehensive Transesophageal Echocardiographic: Examination in Children and All Patients with Congenital Heart Disease: Recommendations from the American Society of Echocardiography. J Am Soc Echocardiogr. 2019 Feb;32(2):173-215.

5. Rodrigues AC, Picard MH, Carbone A, Arruda AL, Flores T, Klohn J, Furtado M, Lira-Filho EB, Cerri GG, Andrade JL. Importance of adequately performed Valsalva maneuver to detect patent foramen ovale during transesophageal echocardiography. J Am Soc Echocardiogr. 2013 Nov;26(11):1337-43.

6. Zhang YX, Zhang XY, Zhang Q. Cough maneuver is superior to Valsalva maneuver for detecting mild-extent right-to-left shunt. Scand Cardiovasc J. 2020 Feb;54(1):32-36.

**KEYWORDS:** Stroke; Patent Foramen Ovale; Transesophageal Echocardiography; Valsalva Maneuver.

Reference this article as:

Shah N, Mulyala R, Ur Rahman M, Riad M, Omar B, Malozzi C. Elusive PFO! *Deep Transgastric Clue on TEE.* Cardiofel Newslet 2024. March; 7(3):7 – 9.