


## Predictors of residual shunt following patent foramen ovale closure: insights from University Hospital Centre Zagreb

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**KEYWORDS:** patent foramen ovale closure, residual shunt, transthoracic echocardiography bubble test.

**CITATION:** *Cardiol Croat.* 2025;20(5-6):112-3. | <https://doi.org/10.15836/ccar2025.112>

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**Introduction:** Recent studies report that the incidence of residual shunting after patent foramen ovale (PFO) closure ranges from 10% to 30%<sup>1</sup>. Several factors have been proposed as potential predictors, including anatomical characteristics of the PFO tunnel, the presence of atrial septal aneurysms, and occluder device size<sup>2,3</sup>. This study aims to evaluate the incidence of residual shunting and identify its predictors in patients who underwent PFO closure at the University Hospital Centre Zagreb.

**Patients and Methods:** We performed a retrospective analysis of patients who underwent PFO closure at UHC Zagreb. Pre-implantation transesophageal echocardiography (TEE) measurements included PFO tunnel size and septal aneurysm presence (**Figure 1**). Implanted device size was recorded from hospital charts. Residual shunting was assessed using transthoracic echocardiography (TTE) bubble test during Valsalva maneuver at 6-month and 1-year follow-ups (**Figure 2**). Statistical analysis included chi-square test, Cramer's V test, and linear multivariate regression.

**Results:** Of 104 attempted PFO closures, device implantation was successful in 100 patients (96.2%). Device size data were available for 98 patients who received the Amplatzer occluder: 50 (51.0%) received an 18/25 mm device, 15 (15.3%) a 25/25 mm device, 9 (9.2%) a 25/30 mm device, 14 (14.3%) a 25/35 mm device, and 10 (10.2%) a 30/30 mm device. Residual shunting was detected in 18 patients (18.0%) exclusively via TTE bubble test. Pre-implantation TEE measurements were available for 54 patients



**FIGURE 1.** Transesophageal echocardiography showing the patent foramen ovale opening during the Valsalva maneuver.

**RECEIVED:**  
March 16, 2025

**ACCEPTED:**  
April 2, 2025



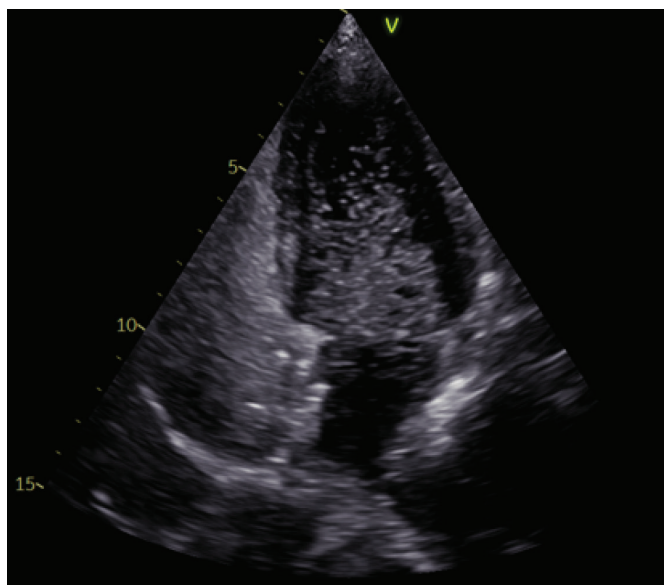


FIGURE 2. Transthoracic echocardiography bubble test showing residual shunting during the Valsalva maneuver.

(54.0%) for PFO tunnel width (mean  $3.9 \pm 2.4$  mm) and 51 (51.0%) for tunnel length (mean  $10.9 \pm 3.6$  mm). Atrial septal aneurysm was reported in 33 patients (33.0%). Larger device size ( $p < 0.001$ ) and left atrial disk ( $p < 0.001$ ) were independent risk factors for residual shunting.

**Conclusion:** The incidence of residual shunting observed in our study (18.0%) aligns with reports from other centers. Notably, all residual shunts were detected exclusively by the TTE bubble test. In our patient population, the only significant predictors of residual shunting were larger device size, particularly the left atrial disk, whereas other studies have identified anatomical PFO features that increase risk.

#### LITERATURE

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